U.S. Doctorates in the 20th Century

Special Report

Lori Thurgood, Mary J. Golladay, and Susan T. Hill

Division of Science Resources Statistics
Directorate for Social, Behavioral, and Economic Sciences

National Science Foundation

June 2006

Division of Science Resources Statistics

The Division of Science Resources Statistics (SRS) fulfills the legislative mandate of the National Science Foundation Act to

> *provide a central clearinghouse for the collection, interpretation, and analysis of data on scientific and engineering resources and to provide a source of information for policy formulation by other agencies of the federal government*

To carry out this mandate, SRS designs, supports, and directs periodic surveys as well as a variety of other data collections and research projects. These surveys yield the materials for SRS staff to compile, analyze, and disseminate quantitative information about domestic and international resources devoted to science, engineering, and technology.

If you have any comments or suggestions about this or any other SRS product or report, we would like to hear from you. Please direct your comments to

National Science Foundation
Division of Science Resources Statistics
4201 Wilson Blvd., Suite 965
Arlington, VA 22230
Telephone: (703) 292-8780
Fax: (703) 292-9092
E-mail: srsweb@nsf.gov

Suggested Citation
National Science Foundation, Division of Science Resources Statistics, *U.S. Doctorates in the 20th Century*, NSF 06-319, Lori Thurgood, Mary J. Golladay, and Susan T. Hill (Arlington, VA 2006).

June 2006

Information and data from the Division of Science Resources Statistics are available on the Web at http://www.nsf.gov/statistics/. To request a printed copy of this report go to http://nsf.gov/publications/orderpub.jsp or call (703) 292-PUBS (7827). For NSF's Telephonic Device for the Deaf, dial toll-free (800) 281-8749 or (703) 292-5090.

CONTENTS

Page

Page

List of Tables

Table *Page*

List of Figures

Figure *Page*

Figure *Page*

Figure *Page*

FOREWORD

Any report on education and education systems is, at its heart, a story about people, places, and the times in which they exist. *U.S. Doctorates in the 20th Century* is about doctoral students, the institutions that provided their education, and the factors—intellectual, scientific, social, political, and economic—that effected change during the most significant and tumultuous period in American graduate education. It is a story told primarily with numbers, in this case, the most extensive and reliable data about those who earned the doctoral degree during this period. The thoughtful narrative adds a human dimension to the tables, charts, and graphs.

The number and kinds of students seeking doctoral degrees during the last 25 years of the 20th century changed dramatically and included more women, minorities, and international students. As knowledge in many fields strained traditional discipline boundaries, new interdisciplinary programs as well as entire new fields developed. The costs associated with graduate education, and the way students paid for their education, became more complex. Career options available to doctoral graduates broadened, and traditional patterns of postgraduate employment changed. These and other changes, shifts, and trends are documented in this publication.

U.S. Doctorates in the 20th Century continues the work begun in its companion volume, *A Century of Doctorates*, published in 1978, and extends the story of American doctoral education to the end of the 20th century. It is an invaluable resource for anyone interested in the nature and scope of doctoral education in the United States.

Jules B. LaPidus, Ph.D.
President Emeritus
Council of Graduate Schools

PREFACE

The availability of new types of data on doctorates, the significant changes in doctoral education known to have occurred in the past 25 years, and the close of the 20th century make this a good time to reexamine the long-term trends in U.S. doctoral education. NSF's Division of Science Resources Statistics commissioned this report to explore these trends and to make the results available to the public. Cosponsors of the report are the National Institutes of Health, the National Endowment for Humanities, the U.S. Department of Education, the U.S. Department of Agriculture, and the National Aeronautics and Space Administration.

The volume is organized into chapters, beginning with an introduction. Chapter 2 traces the development of doctoral education in the United States from its beginnings in the last half of the 19th century and presents general trends on numbers of institutions and doctorate recipients from the early 1900s to 1999.

The third chapter addresses the fields of study in which Ph.D.s receive their doctorates, as well as Ph.D.s' demographic characteristics, including sex, citizenship status, race/ethnicity, age, disability status, marital status and dependents, and the educational attainment of their parents. The data presented in chapter 3 provide the background for the topics presented in chapters 4 through 6. Each of these four chapters begins with a summary of data highlights.

Chapter 4 begins the exploration of the educational path followed by Ph.D.s after they leave secondary school. It considers attendance at 2-year colleges; attainment of bachelor's, master's and professional degrees, including foreign bachelor's degrees; fields of bachelor's, master's, and doctoral degrees, including field switching between the baccalaureate and the doctorate; the primary source of support in graduate school and in doctoral study; activity in the year before receipt of the doctorate; education-related debt; and the time required to earn the doctorate after receiving the baccalaureate. Chapter 5 continues this exploration by providing information on the leading undergraduate and graduate institutions involved in the education of Ph.D.s.

The last chapter, "After the Doctorate," examines the immediate plans of Ph.D.s for employment or further study after graduation, including how definite those plans are and whether the new graduates plan to stay in the United States. For those Ph.D.s with definite employment plans in the United States, the chapter describes their sector of employment, primary work activity, and geographic destination (state). For those Ph.D.s planning to pursue a postdoctoral appointment or other additional study, the chapter examines their financial support mechanisms (such as fellowships and research associateships), settings or sectors for the postdoctoral study, and sources of support.

ACKNOWLEDGMENTS

Six federal agencies provided funding for this project: the National Science Foundation (NSF), the National Institutes of Health (NIH), the U.S. Department of Education (USED), the National Endowment for the Humanities (NEH), the U.S. Department of Agriculture (USDA), and the National Aeronautics and Space Administration (NASA). These same agencies sponsor the annual administration of the Survey of Earned Doctorates (SED) and the maintenance of the Doctorate Records File (DRF), a data bank of doctoral records dating to 1920. The DRF is the source of most data in this report. Until 1997 the National Academy of Sciences/National Research Council (NAS/NRC) conducted the SED; it is currently conducted by the National Opinion Research Center, Chicago, Illinois.

Susan T. Hill, Human Resources Statistics Program (HRS), Division of Science Resources Statistics (SRS), NSF, conceived this report and guided its development. Lori Thurgood (SRI International) prepared the initial report with assistance from Charles Dickens, consultant to SRI, and Michael McGeary, formerly of SRI. Mary J. Golladay, former HRS director, contributed substantially to this report, as did Mary J. Frase, SRS Deputy Division Director, who was acting director of HRS as the report was nearing its final form. Lynda T. Carlson, Division Director, SRS, provided overall guidance for the project; Nancy L. Leach, director, HRS, provided additional guidance. Prudy Brown, Michael Canavan, and Steven Perakis (all of SRI) provided support in completing the figures, tables, and citations. Barbara DePaul (QRC Division of Macro International, Inc.) generated the many detailed tabulations from the DRF that were the basis of the report's analyses. Maurya Green (SRS) conducted historical research and assisted in the preparation of figures and tables. Kevin Mitchell (Aspen Systems, Inc.) edited an early draft of the report. Mary Golladay, Mary Frase, and Cheryl S. Roesel (SRS) designed the final report and directed its production.

Walter Schaffer and Charles Sherman (NIH), Nancy Borkow (USED), Jeff Thomas and Frank Shaw (NEH), and S. Sureshwaran (USDA) provided constructive reviews of the design of the SED and its analysis in reports such as this one. Beatrice Clewell (Urban Institute), Lindsey Harmon, Jules LaPidus, James Maxwell (American Mathematical Society), Peter Syverson (Council of Graduate Schools), and NSF reviewers Robert Bell, Joan Burrelli, James Lightbourne, Joan Lorden, and Judith Sunley reviewed and provided valuable comments on the report.

This report would not have been possible without the legion of people who have been involved with the SED over the years, particularly the doctorate recipients, now more than 40,000 each year, who have completed the SED. The authors extend special thanks to Lindsey Harmon, the author of *A Century of Doctorates: Data Analyses of Growth and Change*, published in 1978 by NAS/NRC. This work provided the authors with much of the historical context for doctoral education in the first three-quarters of the 20th century.

Chapter 1. Introduction

The 20th century was a remarkable era in the history of the United States. This nation, which had been an emerging power on the international scene in 1900, had by century's end become the world's leading power. One of the many factors contributing to this strength was the growth of U.S. doctoral education.

This report describes the history and growth of doctoral education in the United States from 1900 to 1999 and shows changes in the characteristics of persons who complete a doctoral education. It builds on a publication that examined trends in doctoral education in the first three-quarters of the 20th century: *A Century of Doctorates: Data Analyses of Growth and Change*, published in 1978 by the National Academy of Sciences and funded by the National Science Foundation (NSF), the National Endowment for the Humanities, and the U.S. Office of Education (NAS/NRC 1978).

A vast majority of Ph.D.s, however, graduated in the last 25 years of the century and are not represented in *A Century of Doctorates*. Moreover, the characteristics of recent doctorate recipients differ in many ways from those of Ph.D.s a generation earlier. The early 1970s marked the end of a long period of expansion in U.S. doctoral education that began after World War II. By 1974, the last year examined in *A Century of Doctorates*, major changes in doctoral education were just becoming established or would soon become evident: increased representation of women, minorities, and foreign nationals; interruption in the growth of doctoral awards in science and engineering fields; emergence of new fields, such as computer sciences; lengthening of the time it takes to complete doctoral study; expansion of the postdoctoral pool; and reduced academic employment opportunities after graduation.

Some of these trends could not be identified in the earlier report because the relevant data had not yet been collected. Data on race and ethnicity, for instance, were not collected until the mid-1970s. Other useful information began to be collected during the 1980s and 90s. And data available to describe characteristics of doctorate recipients and the graduate education enterprise continued to increase in scope as additional questions were added to the federally sponsored Survey of Earned Doctorates (SED), which was the data collection instrument for this report. Now, for example, it is possible to examine the disabilities of recent Ph.D.s, their debt status at graduation, their primary sources of support in graduate school and doctoral study, and their parents' levels of education.

Data Sources

The primary source of data for this report was the Doctorate Records File, a data bank containing information collected on nearly all of the more than 1.35 million doctorate recipients who received degrees since 1920. For those who earned doctorates between 1920 and June 1957, the data bank contains limited information about their doctoral institution, field of study, graduation year, and sex; this information was gathered from public sources, such as institutional lists and commencement programs. Since July 1957, more detailed data have been collected annually through the SED, which is administered to all new Ph.D.s shortly before they graduate.

The SED data are especially important because the doctorate recipients themselves provide the information. The result is unusually rich data on the demographic characteristics of doctorate recipients, their educational paths, the financial support they received during graduate school, levels of debt related to their education, and their immediate postgraduation plans.

Three important secondary sources were used to supplement the information obtained from the Doctorate Records File. Data on doctoral graduates from 1900 to 1919 came from early annual and biennial reports of the U.S. Office of Education (1869–1916, 1917–56) and from *120 Years of American Education: A Statistical Portrait* (USED/NCES 1993). The aforementioned *A Century of Doctorates* provided much of the historical context for the findings through 1974.

Data Notes and Further Information

This report examines data on research doctorates. The specific kind of research doctorate awarded was first tracked in the SED in 1973. Since then, 85–89 percent of the doctorates awarded each year have been Doctor of

Philosophy (Ph.D.) degrees.[1] This report focuses on the Ph.D. degree, but it includes data collected for about 50 kinds of research doctorates. The terms "Ph.D." and "doctorate" are used in this report to refer to all such degrees. Data on nonresearch and professional degrees, such as the Doctor of Medicine (M.D.), Doctor of Dental Surgery (D.D.S.), Doctor of Veterinary Medicine (D.V.M.), Doctor of Psychology (Psy.D.), and Juris Doctor (J.D.), are not included. See appendix C for definitions and further explanation of key terms.

Data in chapters 3 through 6 are taken from the Doctorate Records File and thus date from 1920. Although Survey of Earned Doctorates data were collected first in the 1957–58 academic year (referred to as 1958 in published reports), the trends based exclusively on SED data are discussed in 5-year cohorts beginning with 1960, and data for much of the report are grouped in 5-year intervals for ease of discussion. Percentages cited in the text are rounded to the nearest whole number if 1 percent or greater and are rounded to the nearest tenth if less than 1 percent. See appendix C, "Technical Notes," for detailed information on data used in this report.

The content of the printed report is available in electronic form on the NSF website at http://www.nsf.gov/statistics/nsf06319/. Also on the website are tables containing supporting data for the figures presented in the report and detailed supplemental tables showing doctoral awards from 1920 through 1999 by field of doctorate and by state and institution, baccalaureate institutions of Ph.D.s from 1920 through 1999, and country of citizenship of non-U.S. citizen doctorate recipients, by visa status, from 1960 through 1999.

Questions or comments about this report may be directed to Susan T. Hill, NSF (sthill@nsf.gov; 703-292-7790), or Lori Thurgood, SRI International (lori.thurgood@sri.com; 703-247-8528).

REFERENCES

National Academy of Sciences, National Research Council (NAS/NRC). 1978. *A Century of Doctorates: Data Analyses of Growth and Change*. Prepared by L.R. Harmon. Washington, DC.

U.S. Department of Education, National Center for Education Statistics (USED/NCES). 1993. *120 Years of American Education: A Statistical Portrait*. Washington, DC.

U.S. Office of Education. 1869–1916. *Annual Report of the United States Commissioner of Education.* Washington, DC: U.S. Government Printing Office.

U.S. Office of Education. 1917–56. *Biennial Survey of Education in the United States.* Washington, DC: U.S. Government Printing Office.

[1] The remainder are distributed among Doctor of Education (Ed.D.) degrees (7–11 percent), Doctor of Musical Arts/Doctor of Music (D.M.A./D.M.) degrees (0.6–1.3 percent), and Doctor of Science (D.Sc./Sc.D.) and Doctor of Arts/Doctor of Arts in Teaching (D.A./D.A.T.) degrees (0.4 percent or less). There are several other kinds of doctorates for specific fields and professions, such as the Doctor of Engineering (D.Eng./Eng.D.), Doctor of Public Health (D.P.H.), and Doctor of Social Work (D.S.W.) degrees; these account for very small percentages of the total number of doctorates awarded each year.

Chapter 2. Historical Background

At the threshold of the 20th century the United States had a small but vigorous graduate education enterprise rooted in a new kind of institution, the research university. The distinctive feature of the research university was the doctoral program. In 1900 most of the approximately 250 research doctorates conferred were from the dozen or so new research universities in the Northeast and Midwest.[1]

The next 100 years of doctoral education were marked by growth and diversification. Doctoral education became available in all 50 U.S. states, the District of Columbia, and Puerto Rico as the number of institutions offering doctoral programs grew. The number of disciplinary fields in which scholarly study was offered at the doctoral level; the number of doctorates awarded annually; and the number of women, minorities, and foreign nationals earning doctorates also grew over the course of the century. By 1999 the number of research doctorates conferred annually had reached more than 41,000, with these representing nearly 400 institutions across the United States.

Between 1900 and 1999 the U.S. graduate education system developed into an integral part of the social and economic structure of the country, contributing to the nation's economic standing and also constituting a significant component of the U.S. economy. By the end of the 20th century, a total of 426 institutions had awarded more than 1.36 million doctorates.

The U.S. Model of Doctoral Education

The United States is unique in the extent to which fundamental research is conducted at universities, typically with the assistance of graduate students. Doctoral education is organized around an intensive, real-world research experience that prepares students to be scholars capable of discovering, integrating, and applying knowledge (CGS 1990). The American system, in which universities conduct research and train doctoral students, has become a model for the world (NAS/NRC 1995). It has played a major role in the United States' strong record of innovation and economic growth and has helped this nation become the global leader in science and engineering (NSB 1998).

American doctoral education produces cutting-edge knowledge and highly trained personnel who go on to fill specialized positions as teachers, researchers, and professionals in academe, industry, government, and nonprofit organizations. In 1999 just over half of new U.S. citizen Ph.D.s with job commitments went into higher education after graduation—48 percent to 4-year institutions and 4 percent to 2-year colleges. About 22 percent of new Ph.D.s found jobs in industry or planned to be self-employed. Eleven percent planned to take jobs in elementary or secondary schools, 9 percent in government (mainly within the federal government), and 6 percent in nonprofit organizations.

A look at Nobel Prize winners during the 20th century illustrates the value of the U.S. doctoral system and the lasting influences of its graduates. Between 1901 and 1999, 162 Americans with doctorates from U.S. universities received 164 Nobel Prizes: 57 prizes for physics, 41 for chemistry, 34 for physiology or medicine, 25 for economics, and 7 for peace (Sherby 2002).

Beginnings of Doctoral Education in the United States

For the greater part of the 19th century, most institutions of higher learning were small and church affiliated and provided a classical education in the liberal arts, producing ministers and other professionals. By the middle of the 19th century, new fields—especially in sciences and engineering—had been added to the curriculum or were being taught in separate institutions, such as the Massachusetts Institute of Technology (founded in 1865), or in separate schools within institutions, such as Harvard's Lawrence Scientific School (1847) and Yale's Sheffield Scientific School (1854). These were not set up to be graduate programs, however. Of necessity, Americans went to Europe, especially Germany, for advanced education, including the doctorate. It has been estimated that 10,000 Americans traveled to Europe in the 19th century to study, more than half in departments of philosophy, the forerunner of arts and sciences (Walters 1965); the others pursued professional studies, such as theology, law,

[1] The U.S. Office of Education reported that 382 doctorates were awarded in 1900, but scholars who examined the data found that approximately one-third of these were awarded for off-campus work, or for no work, by universities lacking legitimate doctoral programs or adequate facilities, and that another 8–10 percent were honorary (Kohler 1990; Berelson 1960; Cattell 1927).

and medicine. Some of these students earned doctorates and then returned to the United States, where most became college professors and many became leaders in the effort to create American universities.

In the mid-19th century, there were numerous proposals and some efforts to develop American universities with graduate programs. The year 1861 is significant not only as the beginning of the Civil War but also as the first year in which doctorates were conferred in the United States. In 1861, three earlier bachelor's graduates of Yale College received the Doctor of Philosophy degree from Yale's Sheffield Scientific School after completing 2 years of graduate study, passing final examinations in several fields, and submitting written dissertations (Storr 1953).

Although Yale awarded four more doctorates in the next 2 years, graduate programs did not begin in earnest until the 1870s (Goldin and Katz 1999). The growth in graduate education was driven by institutional developments and fueled by increasing demand for advanced education at the end of the 19th century and the beginning of the 20th century. The University of Pennsylvania was the second American college to award a doctorate, in 1871, followed by Harvard, which conferred two Ph.D.s and one Sc.D. in 1873 (Bruce 1987). In 1876 an African American was the first racial/ethnic minority to earn a doctorate in the United States, receiving a doctorate in physics from Yale. In 1877 the first woman received a doctorate in the United States.

In the last quarter of the 19th century, a small group of research universities offering doctoral programs emerged in response to a growing demand for knowledge in an industrializing society. The First Morrill Land Grant Act of 1862 gave each state a large grant of public lands to sell for the purpose of founding a college that taught agriculture and the mechanic arts as well as classical studies, leading to an expansion of public universities in the 1870s (NASULGC 1999). Some of these land-grant institutions became early awarders of doctorates, defined in this report as having awarded doctorates before 1920. Chapter 5 discusses the contributions of these early awarders in terms of the number of doctorates they conferred throughout the 20th century.

The Second Morrill Land Grant Act of 1890 led to the establishment of public colleges in southern and border states that did not already have colleges for blacks (USDA 2003). In addition, many of the schools that had been established between 1866 and 1890 to train black teachers were incorporated into the land-grant system under the Second Morrill Land Grant Act. These 18 colleges, known as the 1890 institutions, addressed barriers to higher education that resulted from segregation. Five of these institutions eventually granted doctorates: Alabama A&M University, Florida A&M University, North Carolina A&T State University, South Carolina State University, and Tennessee State University. The 1890 institutions make up nearly one-fifth of the group of institutions known as historically black colleges and universities, or HBCUs (White House Initiative on Historically Black Colleges and Universities 2002).

About the same time, there was an increase in the number of new private colleges with graduate programs (Clark, founded in 1889; Stanford, in 1891; Chicago, in 1892) and reorganization of older ones (Harvard and Columbia). Johns Hopkins University, a private institution founded in 1876, focused primarily on graduate education and emphasized original research by faculty and research-based doctoral dissertations (Storr 1973:41; Geiger 1986:8). Other colleges adapted their graduate programs to the Johns Hopkins model, although they placed more emphasis on teaching. This process was reinforced as Johns Hopkins graduates became professors in other universities.

By the end of the 19th century, the American model of doctoral education had been established. It was based in a research university with undergraduate and graduate programs taught by the same faculty. The faculty members were organized by discipline in departments that were closely linked to the disciplinary scientific societies and specialized scholarly journals that were founded between 1890 and 1905.

The American doctoral program generally included several years of coursework, final examinations, a year or two of research, a language requirement, and a dissertation (Walters 1965). Most recipients became faculty members in colleges and universities whose enrollments were expanding substantially. They were recruited to teach in their specialized area of scholarship.

Despite these advancements, U.S. doctoral education was in disarray at the turn of the century. American students were still flocking to European universities for graduate study, and American universities were viewed with little respect by European universities.

> The problem was that, unlike in Europe, higher education in America was decentralized and largely unregulated; diploma mills proliferated, and even shaky institutions could call themselves "universities" and award Ph.D.s. Some institutions, for example, allowed Ph.D. candidates to pursue courses without showing up on campus and to

> take exams at home under supervision of a proctor. The lack of standards and consistency was hurting the reputations of the more demanding U.S. universities. (Speicher 2000)

In an effort to improve the situation, in January 1900 the presidents of the University of Chicago, Harvard, Columbia, Johns Hopkins, and the University of California–Berkeley invited 14 of the leading doctorate-granting institutions to send representatives to a conference to consider "matters of common interest relating to graduate study." According to the letter of invitation, the conference's goals were to

> 1) result in a greater uniformity of the conditions under which students may become candidates for higher degrees in different American Universities, thereby solving the question of migration, which has become an important issue with the Federation of Graduate Clubs;
> 2) raise the opinion entertained abroad of our own Doctor's Degree;
> 3) raise the standard of our weaker institutions. (AAU 2003)

Thus was founded the Association of American Universities (AAU) (table 2-1). Over the years the number of AAU members has grown, by invitation, from the 14 founders to 59 U.S. universities and 2 Canadian universities.[2] More than two-thirds (110) of the American Nobel Prize winners in the 20th century who earned doctorates in the United States graduated from AAU's founding institutions (Sherby 2002). Harvard (24), Columbia (22), Chicago (17), and the University of California–Berkeley (14) had the most Nobel Prize winners among their doctoral graduates.

Growth in Doctorate-Granting Institutions

Although by 1900 research-based graduate training was a permanent component of American higher education, it was still concentrated in a small set of institutions. The 14 universities that founded the AAU were the leading doctorate producers at that time and accounted for nearly 90 percent of all doctorates awarded in 1900 (Berelson 1960). The number of doctorate-granting institutions increased steadily throughout the 20th century, from fewer than 50 institutions before 1920 to 392 in 1999 (figure 2-1). In 1999 the 59 AAU members awarded 51 percent of the doctorates. The top 10 institutions (based on the number of doctorates conferred), which awarded 86 percent of all doctorates in 1900, awarded less than 16 percent in 1999.

The greatest growth in doctoral programs at U.S. institutions of higher education was in the 1960s and 1970s, after the Soviet Union launched the satellite *Sputnik*. That 1957 event triggered new national policies focused on increasing the number of research universities (PSAC 1960). The number of doctorate-granting institutions grew by 73 in the 1960s and by another 87 in the 1970s. By the mid-1960s, institutions with doctoral programs were in all 50 U.S. states, the District of Columbia, and Puerto Rico (figure 2-2). The rate of growth in the number of new doctorate-granting institutions slowed in the 1980s and 1990s, although the number of doctorates awarded continued to rise.

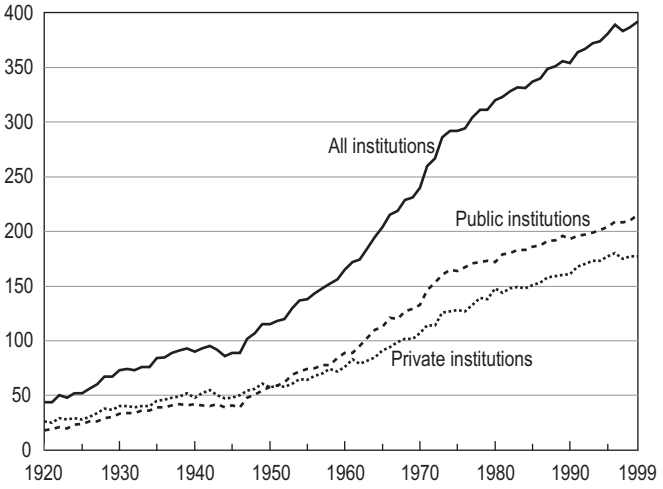
In the last half of the 1940s the regional concentrations of doctorate-granting institutions began to shift away from the Northeast and Midwest into the South and West (figure 2-3). In 1920, 75 percent of all doctorate-granting institutions were located in the Northeast or Midwest. By 1999, 44 percent were in these regions.

TABLE 2-1. Founding institutions of the Association of American Universities

Catholic University of America	Stanford University
Clark University	University of California-Berkeley
Columbia University	University of Chicago
Cornell University	University of Michigan
Harvard University	University of Pennsylvania
Johns Hopkins University	University of Wisconsin-Madison
Princeton University	Yale University

SOURCE: http://www.aau.edu./aau/begin.html, accessed April 2005.

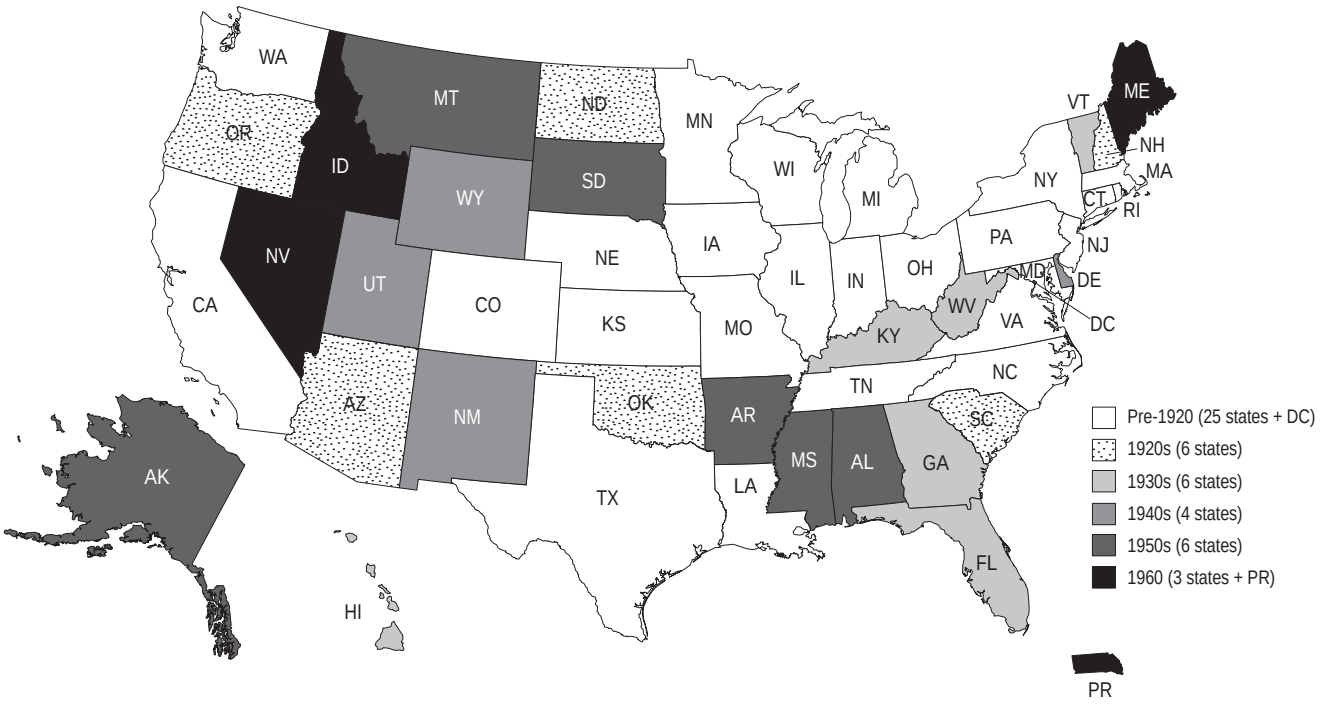
FIGURE 2-1. Doctorate-granting institutions, by control of institution: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

[2] See http://www.aau.edu for more information on AAU and its centennial celebration.

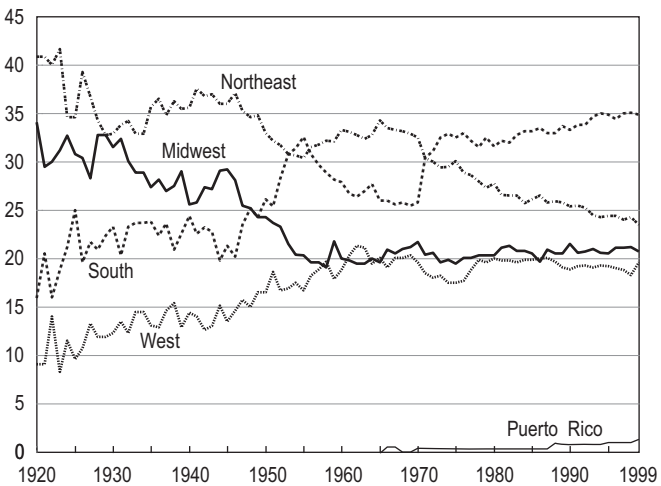
FIGURE 2-2. Decade of first doctoral award in the 50 U.S. states, District of Columbia, and Puerto Rico: pre-1920 to 1960s



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The substantial growth of the general population in the South since the 1970s and in the West since the 1940s also contributed to the establishment of new institutions and new doctoral programs within existing institutions. According to the U.S. decennial censuses, the South's population represented about 31 percent of the total U.S. population until 1970 then rose to nearly 36 percent in 2000 (U.S. Census Bureau 1975, 1998, 2001). The West increased its share of the U.S. population every decade—from less than 6 percent in 1900 to 22 percent in 2000.

FIGURE 2-3. Distribution of doctorate-granting institutions, by region: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

At the same time, the populations in both the Northeast and the Midwest declined as percentages of the total U.S. population—in the Northeast, from about 28 percent in 1900 to 19 percent in 2000, and in the Midwest, from about 35 percent in 1900 to 23 percent in 2000.

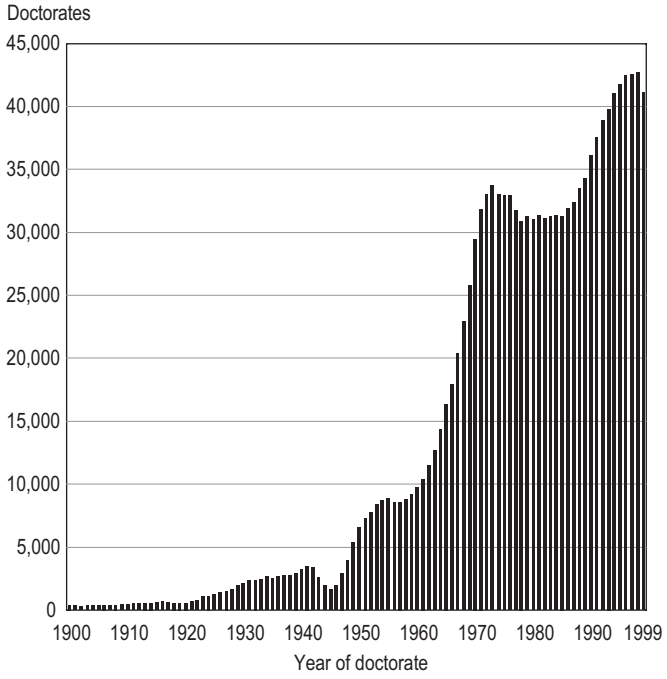
Growth in Doctoral Awards and R&D Spending

The annual number of research doctorates awarded in the first two decades of the century ranged from a low of 293 in 1902 to a high of 667 in 1916. The number of doctorates surpassed 1,000 in 1923, grew to a peak of 33,755 in 1973, and then peaked for a second time at 42,683 in 1998 (figure 2-4). This growth represents an average increase of almost 7 percent per year through the early 1970s.[3] These long-term trends were affected in the short term by such major events as the two world wars and the Great Depression.

Growth was slow at the beginning of the century and declined sharply during World War I. A spurt marked the 1920s, followed by another period of slow growth (but not a decline) during the Depression years of the 1930s. A large decline during World War II was followed

[3] Seven percent annual increases resulted in a near doubling of the annual production of doctorates every 10 years from 1870 to 1970.

FIGURE 2-4. Doctorates awarded: 1900–99



SOURCES: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File (1920–99); U.S. Office of Education annual reports (1900–19).

by sharp increases from 1946 to 1950 and continued growth until 1955. By the mid-1950s, however, the pent-up demand for doctorates following World War II had been spent (NAS/NRC 1978).

The 1960s were characterized by a high rate of growth in annual production of doctorates, fueled by public and government reaction to the launching of the Soviet satellite *Sputnik* in 1957. This achievement prompted a buildup of the graduate education system in the United States through a variety of programs, including graduate fellowships funded under the National Defense Education Act of 1957 and fellowship and traineeship programs of the National Science Foundation, the National Institutes of Health, and the Public Health Service.

National expenditures for research and development (R&D), both federal and nonfederal, increased at an annual rate of about 8 percent in real terms between 1953 and 1969 (table 2-2).[4] Total funding for R&D in colleges and universities also increased rapidly during this period, as did federal support for academic R&D. Many graduate students were supported as research assistants on research grants and contracts. The annual number of doctorates awarded rose from 8,611 in 1957 to 33,755 in 1973, an increase of nearly 9 percent per year.

Cutbacks in R&D funding began in 1969. With the moon landing achieved, energy programs reduced, and costs of the Vietnam War beginning to have an impact on the federal budget, R&D spending was reduced significantly during the 1969–75 period. Federal dollars for academic R&D declined in 1969 and stayed low through 1975. Federal research fellowship and training programs were reduced. The government's share of total academic R&D funding also declined and continued to do so to the end of the century, sliding from a high of 73 percent of all academic R&D funding in 1965–68 to about 58 percent in 1999.

During the 1970s the academic labor market in most fields became saturated, and there was concern about overproduction of Ph.D.s. In addition, the end of draft deferments for graduate students during the Vietnam War (effective 1968) had a negative effect on graduate enrollments of men.[5] Together these conditions resulted in a significant reduction in doctoral awards in the 1970s. By the late 1970s the number of doctorates awarded annually had declined to about 31,000. This number remained almost flat from 1978 to 1985.[6]

With the defense buildup and gains in R&D spending of the 1980s, increases in doctoral awards resumed in all major fields except education. The number of doctorates conferred rose from 31,297 in 1985 to 42,683 in 1998, although the average rate of growth—about 2 percent per year—was much slower than the rate of growth during the first three-quarters of the century.

The relatively high rate of growth in doctorate production during the century means that most of the 1.36 million doctorates awarded between 1900 and 1999 were conferred in the last few decades of the century. More than half of all doctorates were awarded between 1980

[4] The discussion of total R&D and academic R&D is based on NSB 2002, 1:4-3–4-10, 5-3–5-13; 2:A4-5, A4-6, A5-2.

[5] The Selective Service Act of 1967 and Executive Order 11360 ended 2-S deferments for all graduate students except those enrolled in certain programs (mainly medicine and related fields). Graduate students who had been enrolled in fall 1967 were allowed to complete that academic year, after which their deferments ceased. Individuals receiving a bachelor's degree in 1968 were not eligible for further student deferments unless they enrolled in the graduate programs specified (Bowen and Rudenstine 1992).

[6] Institutions reacted in different ways to the retrenchment of the 1970s. The result was a redistribution of students among institutions. Many of the long-established, top-rated doctoral programs reduced or froze graduate enrollments. Institutions in lower tiers with newly created programs chose to continue their programs rather than dissolve them, which would have meant losing their substantial investment in developing the programs. Consequently, large numbers of graduate students shifted to institutions in the lower tiers (Bowen and Rudenstine 1992).

TABLE 2-2. Funding of U.S. research and development: 1953–99
(Millions of constant 1996 dollars)

	All R&D				Academic R&D			
Year	Total	Federal	Industry	Other nonfederal	Total	Federal	Industry	Other nonfederal
1953	26,805	14,455	11,670	681	1,416	774	106	535
1954	28,912	15,957	12,215	741	1,548	846	121	581
1955	31,756	18,217	12,750	789	1,729	966	137	627
1956	41,565	24,342	16,359	863	1,912	1,081	154	677
1957	46,892	29,497	16,420	975	2,049	1,143	173	733
1958	50,439	32,228	17,130	1,081	2,269	1,294	180	795
1959	57,082	37,327	18,576	1,179	2,678	1,625	181	873
1960	61,790	40,176	20,352	1,262	3,175	2,039	180	956
1961	64,903	42,265	21,199	1,440	3,714	2,480	178	1,056
1962	68,761	44,583	22,531	1,647	4,365	3,019	178	1,168
1963	76,169	50,632	23,720	1,817	5,122	3,646	176	1,299
1964	81,846	54,688	25,225	1,932	5,889	4,263	174	1,452
1965	85,165	55,482	27,538	2,145	6,705	4,907	175	1,624
1966	90,236	57,910	29,971	2,355	7,433	5,458	184	1,791
1967	92,608	57,766	32,311	2,530	8,072	5,912	204	1,955
1968	93,788	56,898	34,249	2,641	8,316	6,030	219	2,067
1969	94,222	55,195	36,283	2,744	8,264	5,884	219	2,161
1970	90,404	51,563	35,955	2,886	8,319	5,800	225	2,294
1971	88,308	49,837	35,465	3,006	8,404	5,765	236	2,403
1972	90,321	50,406	36,816	3,099	8,664	5,940	248	2,476
1973	92,118	49,366	39,579	3,172	8,789	5,978	266	2,544
1974	91,095	47,206	40,648	3,241	8,781	5,898	284	2,599
1975	89,112	46,299	39,531	3,282	8,917	5,996	295	2,626
1976	93,227	47,971	41,849	3,406	9,216	6,191	310	2,715
1977	96,449	49,211	43,629	3,610	9,653	6,425	343	2,885
1978	101,127	50,732	46,561	3,834	10,358	6,901	376	3,081
1979	106,137	52,254	49,946	3,937	10,937	7,365	411	3,162
1980	110,927	52,656	54,223	4,048	11,317	7,599	462	3,256
1981	115,868	54,054	57,637	4,178	11,360	7,487	503	3,370
1982	122,034	56,200	61,422	4,411	11,475	7,364	548	3,563
1983	130,770	60,359	65,714	4,696	11,979	7,564	627	3,787
1984	143,259	65,188	73,050	5,020	12,813	8,045	724	4,043
1985	155,757	71,581	78,656	5,519	13,988	8,669	855	4,464
1986	159,789	72,648	80,987	6,155	15,323	9,331	989	5,003
1987	162,798	75,468	80,660	6,671	16,508	10,013	1,071	5,424
1988	166,974	75,028	84,749	7,197	17,728	10,712	1,163	5,852
1989	170,427	72,642	90,028	7,757	18,773	11,186	1,274	6,313
1990	175,761	71,285	96,183	8,293	19,577	11,485	1,347	6,744
1991	179,471	67,836	102,945	8,690	20,301	11,893	1,385	7,024
1992	180,050	66,336	104,779	8,935	21,106	12,548	1,437	7,121
1993	176,198	64,343	102,657	9,197	21,780	13,078	1,479	7,223
1994	176,246	63,316	103,326	9,604	22,488	13,525	1,515	7,448
1995	187,167	64,180	113,017	9,970	23,036	13,843	1,576	7,617
1996	197,330	63,392	123,412	10,526	23,686	14,067	1,667	7,953
1997	208,316	63,544	133,626	11,147	24,608	14,434	1,777	8,397
1998	219,794	64,743	143,254	11,797	25,832	15,103	1,910	8,820
1999	233,027	64,628	155,958	12,441	27,072	15,766	2,036	9,269

NOTE: Detail may not add to total because of rounding.

SOURCE: National Science Board, appendix tables 4-6 and 5-2, *Science and Engineering Indicators 2002*, NSB-02-1A.

and 1999, and three-fourths were conferred between 1970 and 1999 (table 2-3).

Between 1920 and 1999 there was a notable change in the geographical distribution of doctorates conferred. The concentration of degree production in the Northeast and Midwest ended with the relatively greater development of doctorate-granting institutions in the South and West and the greater population growth in these regions after 1920 (figure 2-5). These regional shifts were also

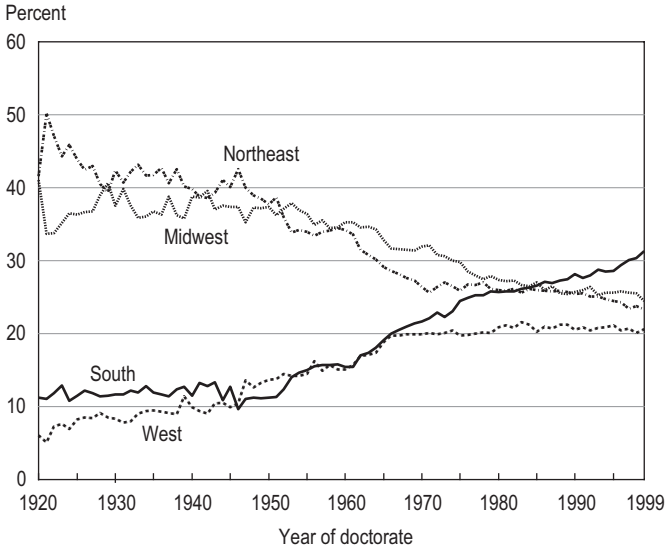
TABLE 2-3. Number and distribution of doctoral awards, by decade: 1900–99

Decade	Number	% distribution
All decades	1,364,069	100.0
1900–09	3,654	0.3
1910–19	5,542	0.4
1920–29	11,935	0.9
1930–39	25,674	1.9
1940–49	30,629	2.2
1950–59	82,689	6.1
1960–69	162,071	11.9
1970–79	320,936	23.5
1980–89	319,501	23.4
1990–99	403,861	29.6

NOTES: The Survey of Earned Doctorates (SED) was collected by calendar year in 1920–1957 and by academic year from 1958 on. Because the second half of calendar year 1957 is part of the 1958 SED, detail does not add to total. The sum of doctorates awarded in 1900–99 is actual and is the number percentages are based on. Percentages do not add to 100 because of rounding.

SOURCES: NSF/NIH/USED/NEH/ USDA/NASA, Survey of Earned Doctorates and Doctorate Records File (1920–99); U.S. Office of Education annual and biennial reports(1900–19).

FIGURE 2-5. Distribution of doctorates awarded, by region: 1920–99

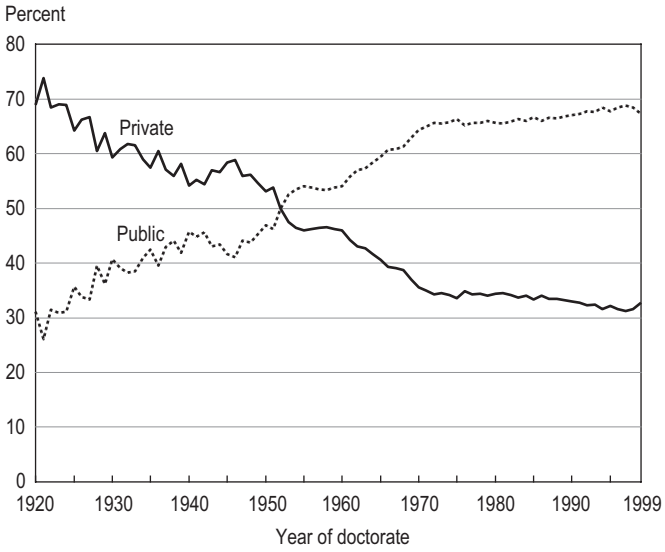


NOTE: The first doctoral degree awarded in Puerto Rico was in 1965; in 1999, Puerto Rico represented 0.3 percent of doctoral awards.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

due in part to the presence of larger, public universities among the newer doctorate-granting institutions. In 1952 the number of public doctoral institutions surpassed the number of private doctoral institutions. One year later the number of doctorates produced by public institutions surpassed the number produced by private institutions (figure 2-6). By the 1970s public universities accounted for about two-thirds of the doctorates conferred each year, a proportion that held steady to the end of the century. Total doctorate production from 1920 to 1999, however, reflects the early concentration of degrees in the Northeast and Midwest (table 2-4). All but 3 of the top 10

FIGURE 2-6. Distribution of doctorates awarded, by control of institution: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 2-4. Doctorates awarded, by region and top 10 state producers: 1920–99

State	Region	Number	Percent
All states		1,354,873	100.0
Top 10 states		808,050	59.6
New York	Northeast	151,545	11.2
California	West	150,447	11.1
Illinois	Midwest	86,648	6.4
Massachusetts	Northeast	81,086	6.0
Pennsylvania	Northeast	72,138	5.3
Texas	South	67,140	5.0
Michigan	Midwest	57,823	4.3
Ohio	Midwest	57,299	4.2
Indiana	Midwest	44,640	3.3
Florida	South	39,284	2.9

NOTE: Detail may not add to total because of rounding.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

states for doctoral awards during the 1920 to 1999 period were in these two regions.

REFERENCES

Association of American Universities (AAU). 2003. The Letter of Invitation to the Founding Conference of AAU. http://www.aau.edu/aau/Invit.html. Accessed April 2005.

Berelson, B. 1960. *Graduate Education in the United States*. New York: McGraw-Hill.

Bowen, W.G., and N.L. Rudenstine. 1992. *In Pursuit of the PhD*. Princeton: Princeton University Press.

Bruce, R.V. 1987. *The Launching of Modern American Science: 1846–1876*. New York: Alfred A. Knopf.

Cattell, J.M. 1927. The origin and distribution of scientific men. *Science* 66 (November 25):513–6.

Council of Graduate Schools (CGS). 1990. *The Doctor of Philosophy Degree: A Policy Statement*. Washington, DC.

Geiger, R.L. 1986. *To Advance Knowledge: The Growth of American Research Universities, 1900–1940*. New York: Oxford University Press.

Goldin, C., and L.F. Katz. 1999. The shaping of higher education: The formative years in the United States, 1890 to 1940. *Journal of Economic Perspectives* 13 (winter):37–62.

Kohler, R.E. 1990. The Ph.D. machine: Building on the collegiate base. *Isis* 81:638–62.

National Academy of Sciences, National Research Council (NAS/NRC). 1978. *A Century of Doctorates: Data Analyses of Growth and Change*. Prepared by L. R. Harmon. Washington, DC.

National Academy of Sciences, National Research Council (NAS/NRC). 1995. *Reshaping the Graduate Education of Scientists and Engineers*. Washington, DC.

National Association of State Universities and Land-Grant Colleges (NASULGC). 1999. The land-grant tradition. http://www.nasulgc.org/publications/Land_Grant/Land_Grant_Main.htm. Accessed April 2005.

National Science Board (NSB). 1998. *The Federal Role in Science and Engineering Graduate and Postdoctoral Education*. NSB 97-235. Arlington, VA: National Science Foundation.

National Science Board (NSB). 2002. *Science and Engineering Indicators 2002*. 2 vols. NSB-02-1. Arlington, VA: National Science Foundation.

President's Science Advisory Committee (PSAC). 1960. *Scientific Progress, the Universities, and the Federal Government*. Washington, DC: U.S. Government Printing Office.

Sherby, L.S., ed. 2002. *The Who's Who of Nobel Prize Winners 1901–2000*. 4th ed. Westport, CT: Oryx Press.

Speicher, A.L. 2000. The Association of American Universities: A century of service to higher education. http://www.aau.edu/aau/Begin.html. Accessed April 2005.

Storr, R.J. 1953. *The Beginnings of Graduate Education in America*. Chicago: University of Chicago Press.

Storr, R.J. 1973. *The Beginning of the Future*. New York: McGraw-Hill.

U.S. Census Bureau. 1975. *Historical Statistics of the United States, Colonial Times to 1970*. Bicentennial ed. Washington, DC.

U.S. Census Bureau. 1998. *Statistical Abstract of the United States*. 118th ed. Annual series. Washington, DC.

U.S. Census Bureau. 2001. *Statistical Abstract of the United States*. 121st ed. Annual series. Washington, DC.

U.S. Department of Agriculture (USDA). 2003. 1890 land grant universities. http://www.reeusda.gov/1890. Accessed March 2003.

Walters, E. 1965. The rise of graduate education. *In* E. Walters, ed., *Graduate Education Today*, pp. 1–29. Washington DC: American Council on Education.

White House Initiative on Historically Black Colleges and Universities. 2002. http://www.ed.gov/about/inits/list/whhbcu/edlite-index.html. Accessed April 2005.

Chapter 3. Field Choices and Demographic Characteristics of Doctorate Recipients

Highlights

- **Fields of Study.** More than 1.35 million research doctorates were awarded in the United States during the last eight decades of the 20th century—62 percent in science and engineering (S&E) and 38 percent in non-S&E.

  Although the number of S&E doctorates exceeded the number of non-S&E doctorates in every year, education was the largest major field from 1962 to 1999.

- **Sex.** Men received about 73 percent of all doctorates awarded between 1920 and 1999. The rapid increase in the numbers of women earning doctorates, beginning in the 1960s, increased their share of doctorates from 15 percent in the early 1920s to 41 percent in the late 1990s.

- **Citizenship Status.** In the late 1980s about one in four Ph.D.s was a foreign national; by the 1990s this proportion had increased to almost one in three. Most foreign doctorate recipients were on temporary visas, most were men, and most studied S&E fields.

- **Race/Ethnicity.** Minorities accounted for nearly 14 percent of all S&E doctorates awarded to U.S. citizens in 1995–99, compared with about 6 percent in 1975–79, when data on race/ethnicity were first collected in the SED. Among U.S. citizens, minorities also increased their share of non-S&E doctorates from less than 10 percent in 1975–79 to more than 14 percent in 1995–99.

- **Age.** Since 1960, the median age of doctorate recipients has increased about 2 years. The median age of Ph.D.s in 1995–99 was 33.7 years; in 1960–64 it was 31.8 years. In 1995–99 the recipients of doctorates in S&E fields were much younger (31.9 years old) than those who received doctorates in non-S&E fields (39.5 years old).

- **Disability Status.** Nearly 4,700 Ph.D.s (almost 2 percent of all doctorate recipients in 1993–99) reported having one or more disabilities, with orthopedic (mobility) disabilities being the most common.

- **Marital Status and Dependents.** Throughout the century, a majority of doctorate recipients were married at the time of graduation. The proportion of married graduates, however, declined from 75 to 60 percent between the early 1960s and 1995–99.

  The percentage of doctorate recipients with children or adult dependents (regardless of marital status) also declined in this period. Men were more likely than women to be married and have dependents.

- **Parents' Education.** On the whole, the level of educational attainment for families of doctorate recipients is higher than the national average.

Introduction

Research doctorates are differentiated by the field studied. Field of study has been a characteristic of doctorates awarded in the United States since 1861, when the first three U.S. doctorates were awarded. Those degrees, conferred by Yale, were in the fields of philosophy and languages, classics, and physics. The number of major fields and field specialties has grown to 363 since then. In this report, 12 major fields of study are used; these are categorized as either science and engineering (S&E) fields or non-S&E fields. Groupings within these two categories are shown in table 3-1. [1]

[1] The NSF classification scheme used for this report groups health sciences with humanities, education, and other professional fields in the broad area of non-S&E. A detailed listing of doctoral degrees awarded by field can be found in appendix A and with the supplemental tables for this report, available on the NSF website at http://www.nsf.gov/statistics/nsf06319/. Other agencies and organizations include health sciences with biological and agricultural sciences in a "life sciences" cluster or combine health sciences with biological sciences to create a "biomedical sciences" cluster.

TABLE 3-1. Major fields of study and doctorates awarded: 1920–99

Field	Doctorates awarded
Science and engineering	835,221
Agricultural sciences	39,456
Biological sciences	167,179
Earth, atmospheric, and ocean sciences	27,066
Mathematics and computer sciences	52,466
Physical sciences	152,857
Psychology	112,623
Social sciences	136,698
Engineering	146,876
Non-science and engineering	519,652
Education	256,014
Health sciences	28,098
Humanities	171,870
Professional fields/other	63,670

NOTES: Field data are available from the Doctorate Records File beginning in 1920. Appendix table A-1 shows the number of doctoral awards for the complete list of detailed fields, grouped by these major fields.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The demographic characteristics of doctorate recipients also changed substantially over the course of the century. Except in certain fields, the participation of women in doctoral education increased significantly relative to that of men. Racial and ethnic minorities also made substantial percentage gains in doctoral awards, although the absolute numbers of doctorates received by minorities remained low compared with whites. The number and percentage of doctorates awarded to non-U.S. citizens increased sharply in the 1980s and 1990s.[2] Other characteristics of doctorate recipients—their ages at graduation, disability status, likelihood of being married and having dependents, and the educational attainment of their parents—are also examined here.

Fields of Study

Fields of study are not static; they change as research advances the frontiers of knowledge, as shown by the influence of quantum mechanics on physics and the influence of plate tectonics on geology. New fields emerge, as computer sciences did in the last quarter of the 20th century. Many research programs have become multidisciplinary or interdisciplinary in recent decades. The federal agencies that sponsor the SED review the survey's list of field specialties annually and update it periodically. Appendix table A-1 shows the complete list of field specialties used in the SED, grouped by major field.

The distribution of doctorates across S&E and non-S&E fields reveals a stable picture. In every year from 1920 to 1999, the number of doctoral awards in S&E fields was greater than the number in non-S&E fields (table 3-2). Of the 1,354,873 doctorates granted by U.S. institutions between 1920 and 1999, 62 percent were in major fields considered S&E and 38 percent were in fields considered non-S&E. The S&E share of degrees dropped below 60 percent only in the 1945–46 academic year, the 1970s, and the early 1980s. In 1999 U.S. institutions awarded 41,140 doctorates, 25,953 in S&E fields and 15,187 in non-S&E fields.[3]

Four of the top five major fields in 1995–99 were also in the top five in 1920–24, but only biological sciences held the same rank in both periods. Table 3-3 shows the top five major fields in 1920–24 and in 1995–99. The number of doctorates awarded in each major field from 1920 to 1999 is shown in figure 3-1. Table 3-4 shows the number of doctorates awarded in each major field in 1995–99 and in 1999, as well as the peak year for each field.

Science and Engineering

Agricultural Sciences

Doctorate production in the field of agricultural sciences grew throughout the century except for small dips in the mid-1970s and the 1990s. Nonetheless, it remained the smallest S&E major field after earth, atmospheric, and ocean sciences.

Biological Sciences

Before World War II, biological sciences was one of the more rapidly growing fields in terms of the number of doctorates awarded, and it resumed its growth after the war. Subsequently, after some years of fluctuation, the field began another period of dramatic growth in the late 1980s. Biological sciences was one of the largest doctoral fields throughout the 20th century, with 167,179 doctorates awarded between 1920 and 1999.

[2] Data in chapters 3 through 6 are taken from the Doctorate Records File and thus date from 1920. Although Survey of Earned Doctorates (SED) data were collected first in the 1957–58 academic year (referred to as 1958 in published reports), the trends based exclusively on SED data are discussed in 5-year cohorts beginning with 1960. Data are grouped in 5-year intervals for ease of discussion and to permit "smoothing" of data for small groups.

[3] In 1999 European universities conferred 54,000 S&E doctorates, and Asian universities conferred 21,000 S&E doctorates. European universities awarded more doctorates than either the United States or Asia in each of the broad areas of S&E. U.S. universities conferred more doctorates in all science fields in 1999 than did Asian universities but conferred fewer in engineering (NSB 2002, 1:2-41–2-42).

TABLE 3-2. Doctorates awarded, by broad field of doctorate: 1920–99

	Doctorates awarded			% distribution		
5-year period	All fields	Science and engineering	Non-science and engineering	Total	Science and engineering	Non-science and engineering
All periods	1,354,873	835,221	519,652	100	61.6	38.4
1920–24	4,199	2,724	1,475	100	64.9	35.1
1925–29	7,736	4,907	2,829	100	63.4	36.6
1930–34	11,977	7,455	4,522	100	62.2	37.8
1935–39	13,697	8,487	5,210	100	62.0	38.0
1940–44	14,725	9,267	5,458	100	62.9	37.1
1945–49	15,904	10,014	5,890	100	63.0	37.0
1950–54	38,670	25,277	13,393	100	65.4	34.6
1955–59	44,019	28,308	15,711	100	64.3	35.7
1960–64	58,699	38,267	20,432	100	65.2	34.8
1965–69	103,372	66,183	37,189	100	64.0	36.0
1970–74	161,208	94,862	66,346	100	58.8	41.2
1975–79	159,728	90,804	68,924	100	56.8	43.2
1980–84	156,105	91,690	64,415	100	58.7	41.3
1985–89	163,396	100,930	62,466	100	61.8	38.2
1990–94	193,326	123,214	70,112	100	63.7	36.3
1995–99	210,535	134,271	76,264	100	63.8	36.2

NOTES: The Survey of Earned Doctorates (SED) was collected by calendar year from 1920 through 1957 and by academic year from 1958 on. Because the second half of calendar year 1957 is part of the 1958 SED, detail does not add to total. The sum of doctorates awarded in 1920–99 is actual and is the number percentages are based on.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 3-3. Leading major fields of study in order of doctorates awarded: 1920–24 and 1995–99

1920–24	1995–99
Physical sciences	Education
Humanities	Engineering
Biological sciences	Biological sciences
Social sciences	Humanities
Education	Social sciences

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 3-4. Doctorates awarded, by major field: 1995–99, 1999, and peak year

Field	1995–99	1999	Peak year (doctorates)	
All fields	210,535	41,140	1998	(42,683)
Education	33,126	6,557	1976	(7,725)
Engineering	29,694	5,337	1996	(6,305)
Biological sciences	28,339	5,600	1998	(5,854)
Humanities	24,599	5,045	1973	(5,155)
Social sciences	20,106	4,060	1997	(4,111)
Physical sciences	18,857	3,582	1994	(3,977)
Psychology	17,843	3,667	1998	(3,685)
Professional fields/other	11,549	2,175	1995	(2,539)
Mathematics and computer sciences	10,302	1,935	1995	(2,187)
Health sciences	6,990	1,410	1998	(1,503)
Agricultural sciences	5,057	965	1990	(1,174)
Earth, atmospheric, and ocean sciences	4,073	807	1997	(878)

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Earth, Atmospheric, and Ocean Sciences

Lower numbers of doctorates were awarded in earth, atmospheric, and ocean sciences from 1920 to 1999 than in any other major field. Growth in doctoral awards, however, was dramatic within its detailed fields: atmospheric sciences, geosciences, and oceanography. Geosciences nearly doubled between 1960–64 and 1995–99, whereas atmospheric sciences increased sixfold and oceanography increased about ninefold (appendix table A-1).

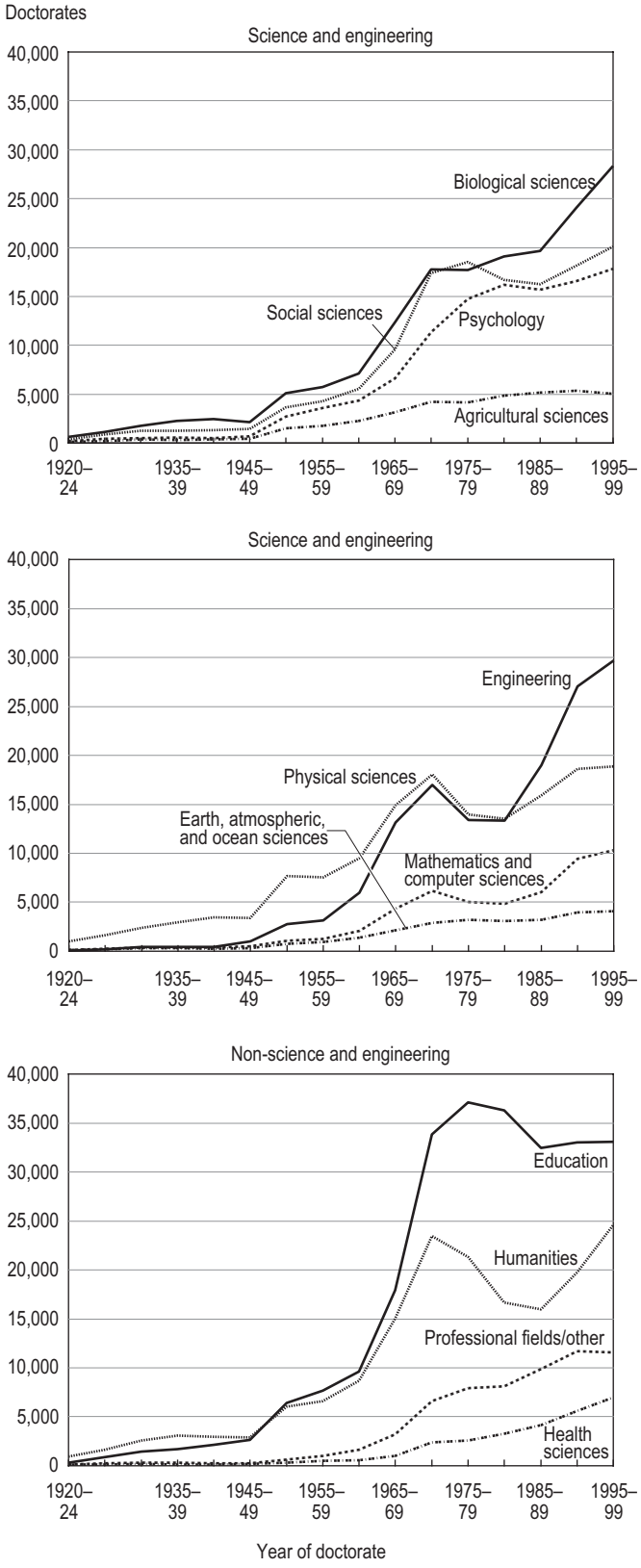
Mathematics and Computer Sciences

Nearly all doctorates in the first two-thirds of the century in the major field of mathematics and computer sciences were awarded in mathematics. The pace of doctorate production in mathematics quickened during the 1960s, with the number peaking at 1,281 in 1972 then decreasing to fewer than 1,000 by 1977.

Until 1978 the SED had no code for computer sciences; data from 1920 to 1977 are for degrees in the field of mathematics only.[4] Results for computer sciences show

[4] The National Center for Education Statistics (NCES), U.S. Department of Education, began collecting data from institutions on the field of computer science a decade earlier than the SED did. NCES data show 196 doctorates in computer science in 1978, numbers considerably higher than the 1978 SED number of 121 (NSF 2002, table 46).

FIGURE 3-1. Doctorates awarded, by major field: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

an increase in doctorates from about 200 in 1979 to almost 1,000 in 1995, after which they declined.

Physical Sciences

From 1920 until the early 1960s physical sciences led all other major fields in doctoral awards. The field's greatest growth occurred after the Soviet Union's launch of *Sputnik*, in 1957, and growth continued through the 1960s. Then, with deep cuts in U.S. space and energy programs in the 1970s, awards of physical sciences doctorates began to drop. Most of this decline can be attributed to chemistry, a specialty (detailed field) of physical sciences. Chemistry's share of all doctorates fell from 18 percent in 1920–24 to 5 percent in 1975–79, where it has remained. The other detailed field of physical sciences, physics and astronomy combined, also accounted for a smaller share of doctorates in the last three decades of the century, but its decline was not as severe as that of chemistry. Growth in doctorate production in physical sciences resumed in the 1980s, and a new peak was reached in 1994, after which the number of physical sciences doctorates awarded annually decreased. Between 1920 and 1999, 93,746 doctorates were awarded in chemistry, and 58,737 doctorates were awarded in physics and astronomy. Physical sciences ranked fourth in overall doctorate production during the 20th century.

Psychology

Psychology grew in doctorate production throughout the century except for a slight downturn in the late 1980s. The number of doctoral awards in psychology rose sharply after World War II and again in the 1960s and early 1970s. Unlike many of the other S&E fields, psychology did not experience declines in doctorate production during the 1970s.

Social Sciences

Social sciences remained among the top five major fields for doctorate production throughout the century. For most of the 1920–99 period, social sciences accounted for a relatively stable 9 to 11 percent of all doctorates.

Engineering

By 1995–99 engineering had replaced physical sciences among the top five major fields. From 1920–24 to 1995–99 doctoral awards in engineering rose from 60 to 29,694, or from less than 2 percent to 14 percent of all doctorates awarded. Drops in the last 3 years of the century were directly related to a decline in the number of non-U.S.

citizens who received doctorates in the final years of the century.

Non-Science and Engineering

Education

The field of education produced more doctorates every year from 1962 to 1999 than any other major field. Education's share of doctorates was nearly 16 percent by 1995–99 but was greatest in the 1970s and 1980s, when it ranged from 20 to 23 percent. The number of awards remained level from the late 1980s through the end of the century.

Health Sciences

Doctorates awarded in health sciences, the smallest of the non-S&E major fields, grew from 100 in 1920–24 to 6,990 in 1995–99, and the field's share of all doctorates increased from 2 to 3 percent over that period.

Humanities

Humanities was the second largest of the major fields for production of doctorates in 1920–24 and was the fourth largest in 1995–99.

Professional and Other Fields

The number of doctorates awarded in professional and other fields grew slowly but continuously through the mid-1960s and then more rapidly through the early 1970s.[5] Doctoral awards in these fields had another period of rapid growth in the 1980s, then began to stabilize in the 1990s.

Demographic Characteristics of Ph.D.s

Overall growth of the U.S. population naturally contributed to increases in doctorates earned over the course of the century. The demographic composition of doctorate recipients changed substantially as well. Long-term trends in the demographic characteristics of doctorate recipients—sex, citizenship status, and race/ethnicity—are examined here.[6]

[5] This major field includes doctorates in business management and administrative services, communications, and other professional fields, such as architecture and environmental design, library science, public administration, and social work.

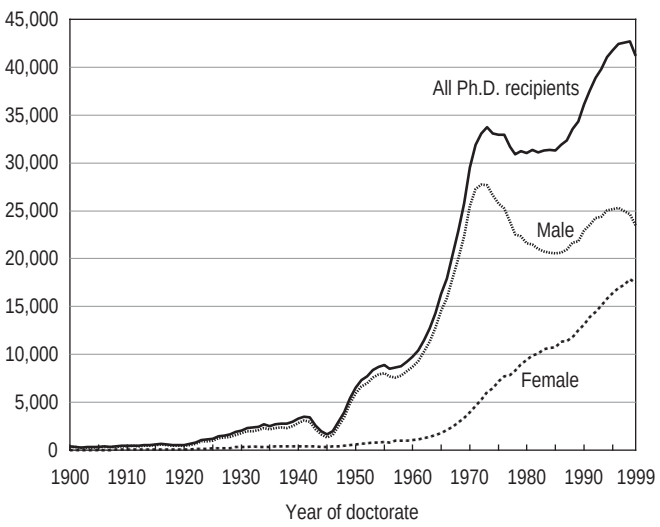
[6] A listing of the country of citizenship of non-U.S. citizen Ph.D.s by visa status can be found with the supplemental tables for this report on the NSF website at http://www.nsf.gov/statistics/nsf06319/.

Sex

Throughout the 20th century men earned the majority of doctorates and accounted for much of the substantial increase in total doctorate production (figure 3-2). For the period 1920–99 men received 73 percent of all doctorates awarded and women received 27 percent. Most of the growth in doctorate production among men in the late 1980s and the 1990s resulted from the large increases in the numbers of foreign men seeking graduate education in the United States, not from greater numbers of U.S. men receiving doctorates. The percentage of male doctorate recipients who were foreign nationals rose from 22 percent in 1980–84 to 38 percent in 1990–94.

Changes in public policies after World War II created a more favorable climate for growth in doctorate production, noted first among men, than existed in the prewar years. In the 1950s the number of men earning doctorates surged (figure 3-2). This trend can be largely attributed to the G.I. Bill, enacted in 1944, which afforded returning World War II veterans the opportunity and financial support to begin or continue their education. A second period of substantial growth in doctorate production by men occurred in the post-*Sputnik* era, from the 1960s to the early 1970s. Among the contributing factors were new or expanded federal programs for graduate fellowships and traineeships as well as student deferments during part of the Vietnam War. In the 1970s concerns about a possible oversupply of Ph.D.s led to modification or curtailment of some federal and private programs that supported graduate students, and the

FIGURE 3-2. Doctorates awarded, by sex of recipient: 1900–99



SOURCES: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File (1920–99); U.S. Office of Education annual and biennial reports (1900–19).

number of men earning doctorates declined. The end of draft deferments for graduate students in 1968 was another major factor in the sharp decline in doctoral awards to men starting in the early 1970s.

Trends in doctorate production for women were distinctly different from those for men. The period of dramatic growth in doctorates earned by women began in the 1960s and continued to the end of the century. Almost 43 percent of all doctorates awarded to women between 1920 and 1999 were awarded in the 1990s. The proportionate gains for women were truly remarkable: women's share of all doctorates conferred rose from 15 percent in 1920–24 to 41 percent in 1995–99 (figure 3-3). Yet at the close of the century, women were still underrepresented relative to their presence in the college-educated population. In 1999 women constituted 43 percent of all Ph.D.s, compared with 48 percent of the U.S. population 25 and older with 4 years of college (U.S. Census Bureau 2000, table 251).

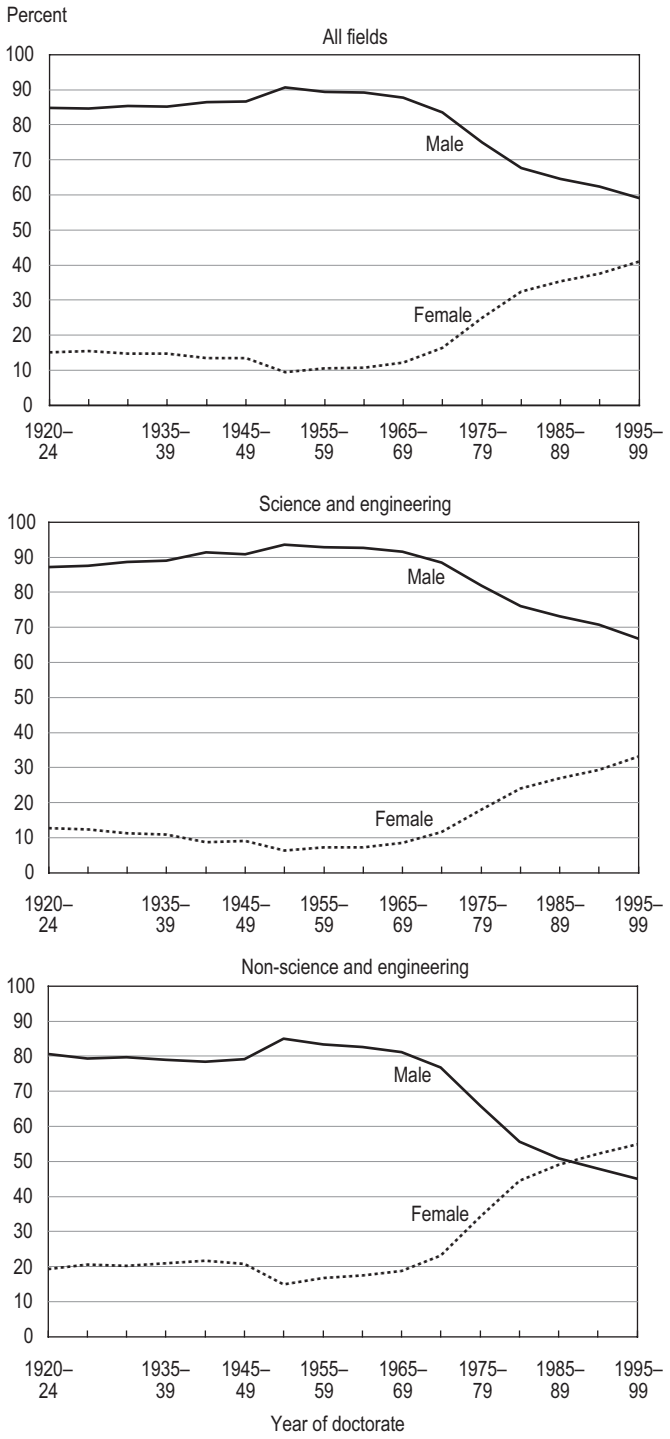
In 1960 women earned 1,042 doctorates; in 1999 they earned 17,493 doctorates. A convergence of influences accounts for this growth: the general increase in the young adult population as the baby boomers came of age, the women's movement, affirmative action policies, and targeted federal and private investments to increase the number of women with advanced degrees. Foreign women entering the United States for graduate education also contributed to growth in doctorate production by women. In the early 1960s 11 percent of all female Ph.D.s were foreign nationals; by the late 1990s the figure was about 21 percent.

From 1920 to 1999 more than twice as many men received S&E doctorates as received non-S&E doctorates (figure 3-4). It was only during the last period in the century, 1995–99, that women earned more doctorates in S&E fields than in non-S&E fields. From 1920–24 to 1995–99, women's share of all S&E doctorates awarded increased from 13 to 33 percent, and women's share of all non-S&E doctorates awarded increased from 19 to 55 percent (figure 3-3). From 1960 to 1999 the greatest percentage increase in doctorates earned by women in non-S&E fields was in health sciences, and in S&E fields it was in psychology (figure 3-5).

Citizenship Status

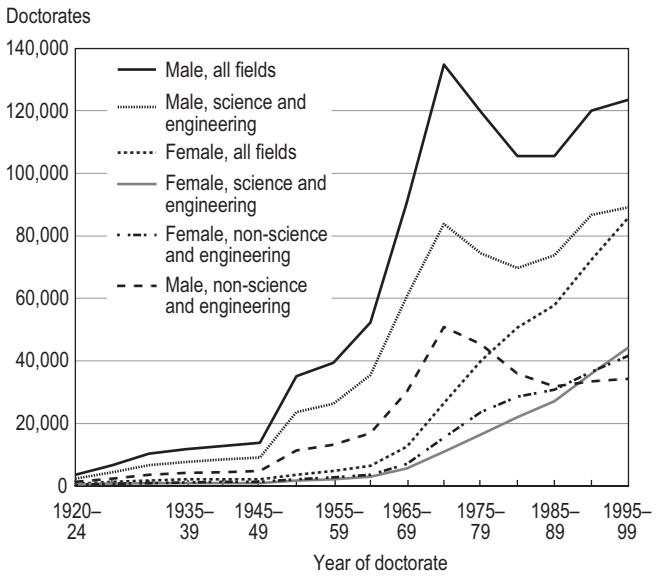
During the last four decades of the century, non-U.S. citizens earned increasing shares of doctoral awards in each of the major fields. From 1920 to 1959 doctoral awards to non-U.S. citizens rose from 6 to 12 percent of all doctorates awarded. From 1960–64 to 1995–99, the share of doctorates awarded to foreign nationals rose from 16 to 39 percent in all S&E fields combined and from 7 to 17 percent in non-S&E fields (figure 3-6). Most foreign nationals, both men and women, received their degrees in S&E fields.

FIGURE 3-3. Distribution of doctorates awarded, by sex of recipient and broad field of doctorate: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-4. Doctorates awarded, by sex of recipient and broad field of doctorate: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

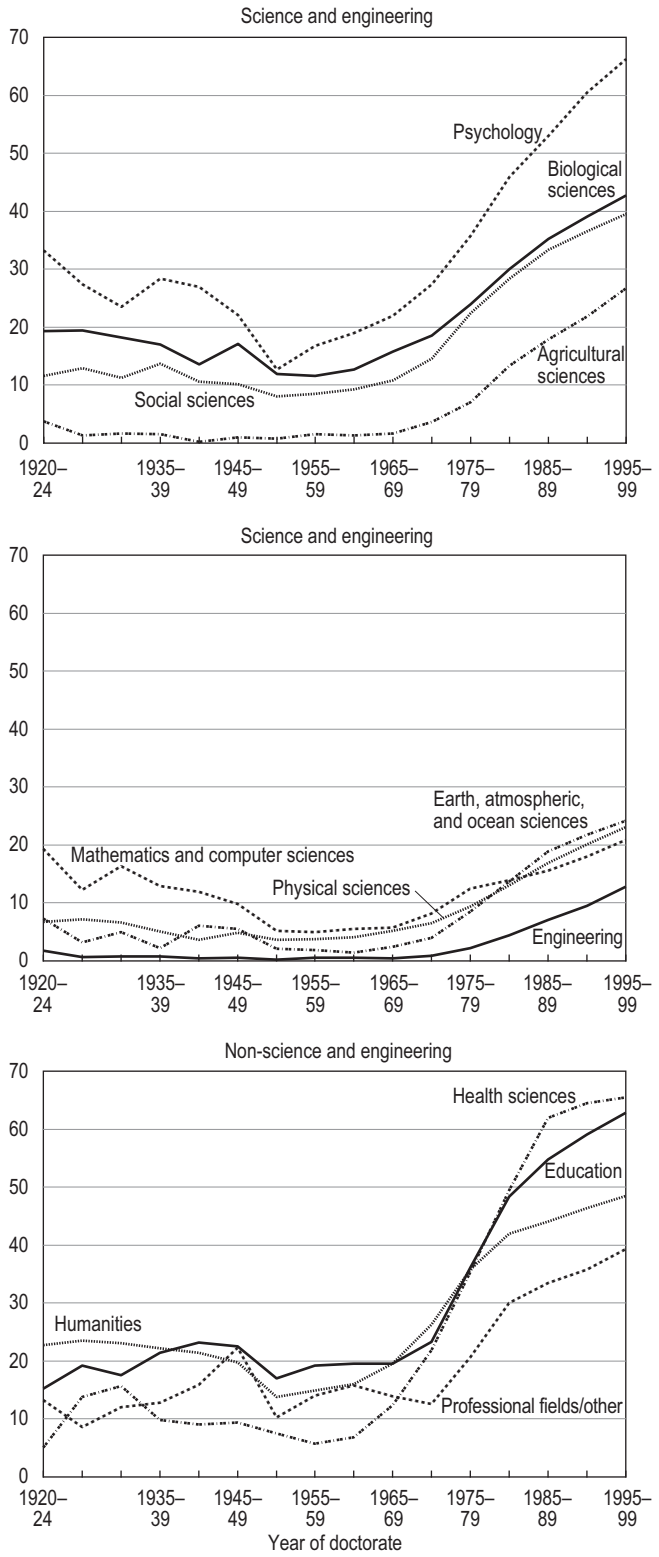
From the mid-1980s to the end of the century, major political events were reflected in the tremendous growth in the overall number of foreign students earning doctorates in the United States. By the late 1980s about one in four Ph.D. recipients was a foreign national. This proportion rose to almost one in three in the early 1990s (figure 3-7). Most foreign nationals who earned doctorates held temporary visas, and four in five were men.

Origins of Non-U.S. Citizens

A large majority of foreign nationals who earned U.S. doctorates between 1960 and 1999 were from Asia (figure 3-8). During this period, China, India, Taiwan, and Korea were the top four places of origin for non-U.S. citizen Ph.D.s. Students from the People's Republic of China received more than 24,000 of the doctorates awarded by U.S. universities in the 1990s (figure 3-9). As was true for foreign nationals overall, Asian citizens were awarded doctorates primarily in S&E fields. They received 44 percent of all engineering doctorates and 22 percent of all science doctorates conferred in 1995–99.

Trends in doctorate awards to non-U.S. citizens reflect consequences of the 1989 uprising at Tiananmen Square in Beijing, China, an event that led to the adoption of the Chinese Student Protection Act of 1992. This act made thousands of Chinese students who were enrolled in U.S. institutions in 1989 eligible for permanent residency on 1 July 1993. As a result, the percentage of Chinese Ph.D.s with temporary visas, which had been more than 95 percent in 1990, fell to a low of about 21

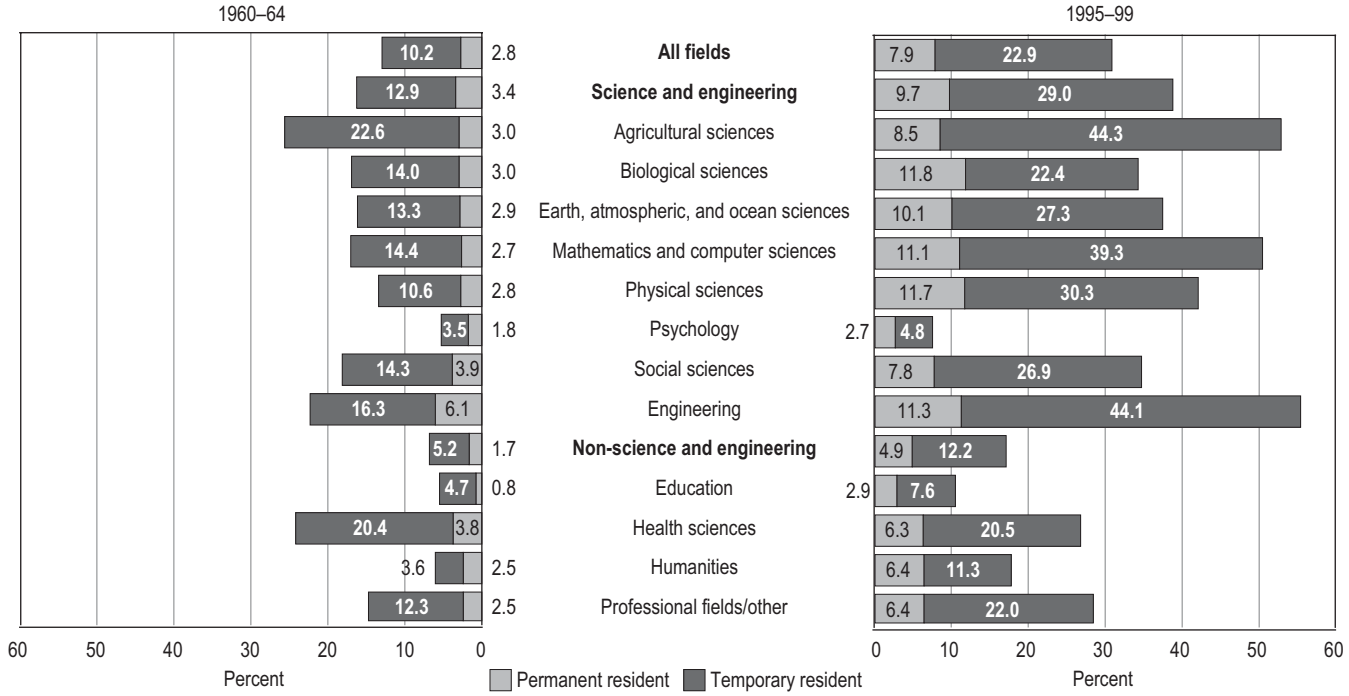
FIGURE 3-5. Women's share of doctorates awarded, by major field: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

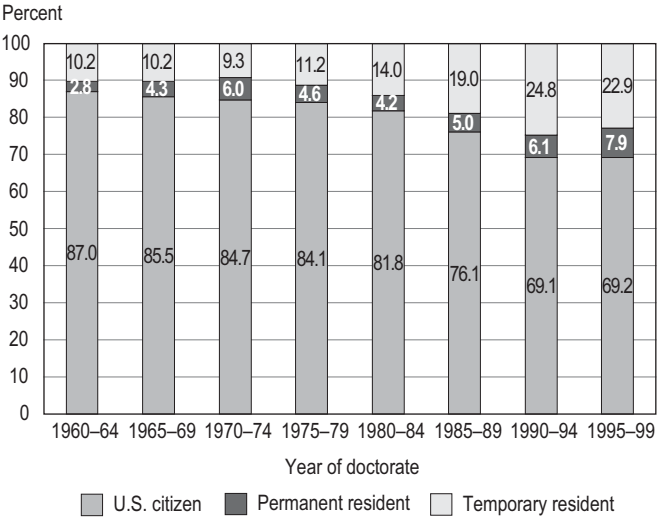
percent in 1995. It started to rise again in 1996, reaching 74 percent by 1999, as the pool of Chinese students eligible for permanent residency and still in graduate school

FIGURE 3-6. Non-U.S. citizens' share of doctorates awarded, by major field: 1960–64 and 1995–99



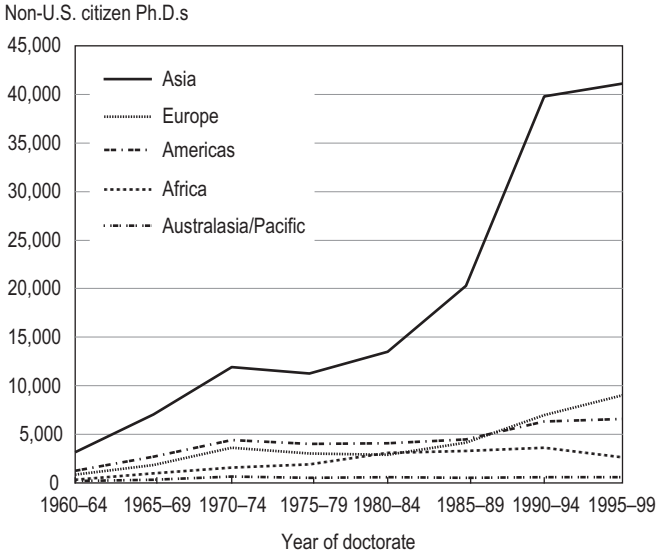
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-7. Citizenship status of Ph.D.s: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-8. Regional origins of non-U.S. citizen Ph.D.s: 1960–99

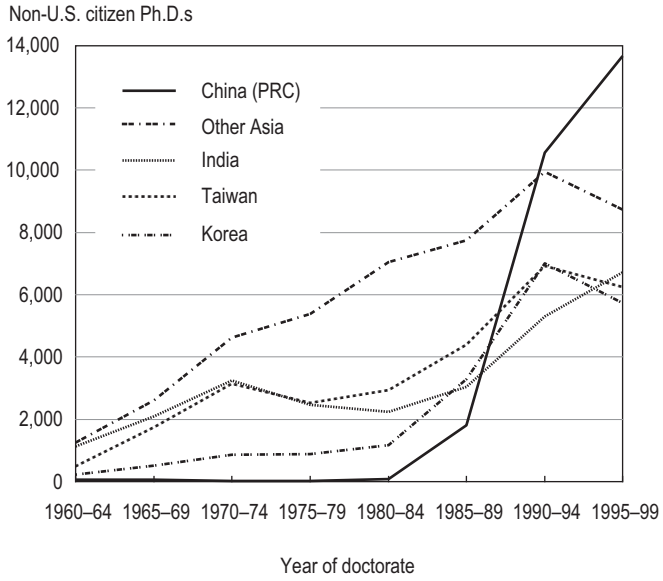


SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

diminished. Because China was the leading country of origin of non-U.S.-citizen Ph.D.s throughout the 1990s, the shift in the visa status of Chinese doctorate recipients caused a shift in the statistics for Asia as a whole. The percentage of Asian-citizen Ph.D.s with temporary visas fell from 88 percent at the beginning of the 1990s to a low of 64 percent in 1995, then rose to more than 81 percent in 1999.

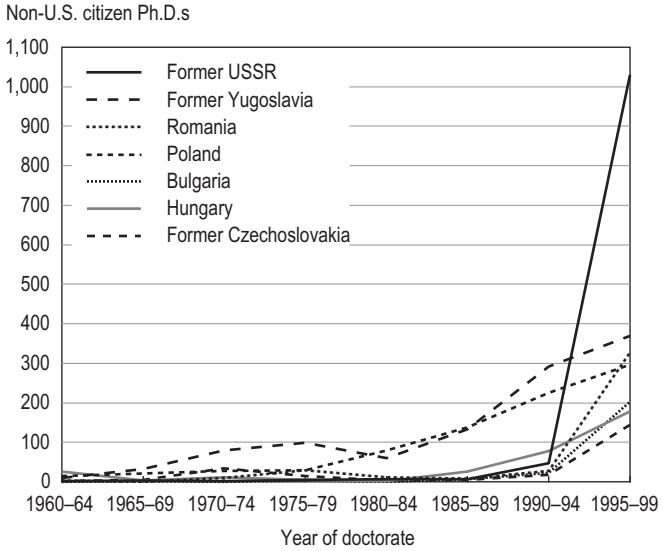
With the end of the cold war came rapid growth in the number of doctorates granted to citizens of eastern European countries and the republics of the former Soviet Union (figure 3-10). In 1995–99, 1,030 doctorates were awarded to citizens of the former Soviet Union (mostly to citizens of Russia), compared with 47 doctorates in 1990–94 and 12 doctorates in the 1980s. Citizens of Romania, Bulgaria, and the former Czechoslovakia also

FIGURE 3-9. Leading Asian origins of non-U.S. citizen Ph.D.s: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-10. Leading Eastern European origins of non-U.S. citizen Ph.D.s: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

increased their numbers of doctorates in the late 1990s, although by a smaller amount.

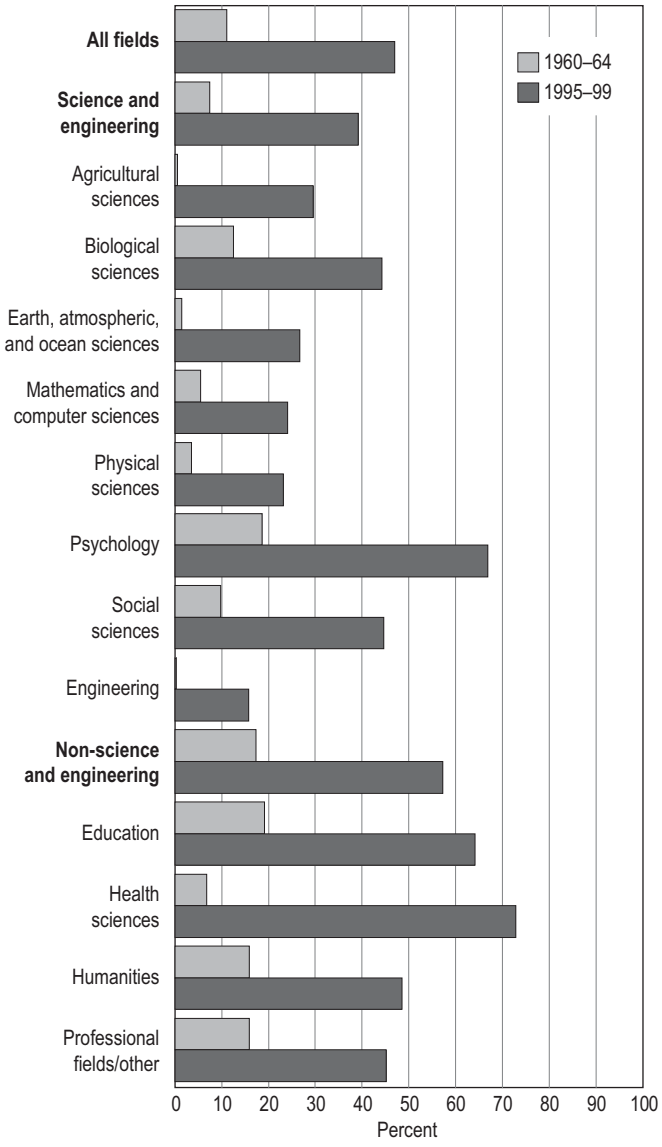
Women

Between the periods 1960–64 and 1995–99, female Ph.D.s increased their presence in every citizenship group, with women's share of doctorates rising from 10 to 36 percent among permanent residents and from 9 to 24 percent among temporary residents, but rising most noticeably among U.S. citizens. Women made up 47 percent of all U.S.-citizen Ph.D.s in 1995–99, a greater than four-fold increase from 1960–64 (11 percent). U.S. women made notable gains in both S&E and non-S&E major fields during the same period, increasing their share of all S&E doctorates awarded to U.S. citizens from 7 to 39 percent and their share of non-S&E doctorates from 17 to 57 percent (figure 3-11).

Race/Ethnicity

From 1975, when data on race/ethnicity were first collected in the SED, to 1999, three groups accounted for almost 90 percent of all doctorates awarded in the United States: white U.S. citizens (68 percent), Asian

FIGURE 3-11. Women's share of doctorates earned by U.S. citizens, by major field: 1960–64 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

foreign nationals (14 percent), and white foreign nationals (8 percent). Minority U.S. citizens accounted for most of the remainder: blacks (3 percent), Asians/Pacific Islanders (2 percent), Hispanics (2 percent), and American Indians/Alaskan Natives (0.3 percent).[7] The largest Hispanic subgroup among Hispanic Ph.D.s was Other Hispanic, followed by Mexican American and Puerto Rican (figure 3-12). According to a study of Hispanic Ph.D.s from 1983 to 1997, the subgroup Other Hispanic also ranked first in shares of S&E doctorates, followed by Puerto Rican and Mexican American (Quintana-Baker 2002).

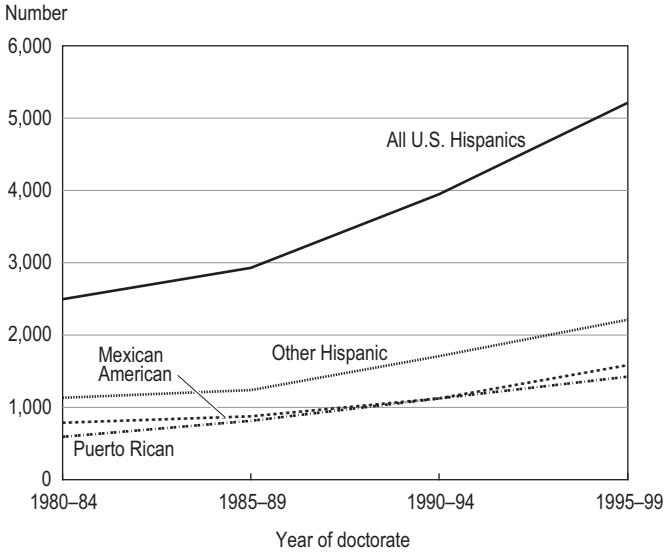
Of doctorates awarded to U.S. citizens, the share earned by members of minority groups increased from 8 percent in 1975–79 to 14 percent in 1995–99 (figure 3-13). The number of awards to minorities remained relatively low despite high proportionate gains. Between 1975–79 and 1995–99 the number of doctorates earned by Asians/Pacific Islanders who were U.S. citizens increased over threefold, from 1,777 to 6,039 degrees, and the number of doctorates earned by U.S. citizens who were members of underrepresented minorities (American Indians/Alaskan Natives, blacks, and Hispanics) nearly doubled, from 7,644 to 13,176 (figure 3-14).

Minorities received almost 14 percent of all S&E doctorates awarded to U.S. citizens in 1995–99, up from 6 percent in 1975–79. Between 1975–79 and 1995–99 the percentage growth in S&E doctoral awards to U.S. citizens was greater for minorities than for whites, and growth in awards to minority citizens in S&E fields was somewhat greater than growth in awards to minorities in all fields combined. By 1995–99 a majority of Ph.D.s in every racial/ethnic group except blacks were in S&E fields, with Asians/Pacific Islanders having the largest proportion of Ph.D.s in S&E fields (table 3-5).

Minority citizens earned more than 14 percent of the non-S&E doctorates awarded to U.S. citizens in 1995–99, up from about 10 percent 20 years earlier (figure 3-15). In 1995–99 blacks accounted for more than half of the non-S&E doctorates earned by minorities and more than 7 percent of all non-S&E doctorates awarded to U.S. citizens. Blacks received more than one-tenth of all education doctorates in 1995–99 and also received larger shares of degrees in health sciences and professional and other fields than were received by members of other minority groups (figure 3-16). Hispanics earned the largest share of humanities doctorates (nearly 4 percent) among minorities.

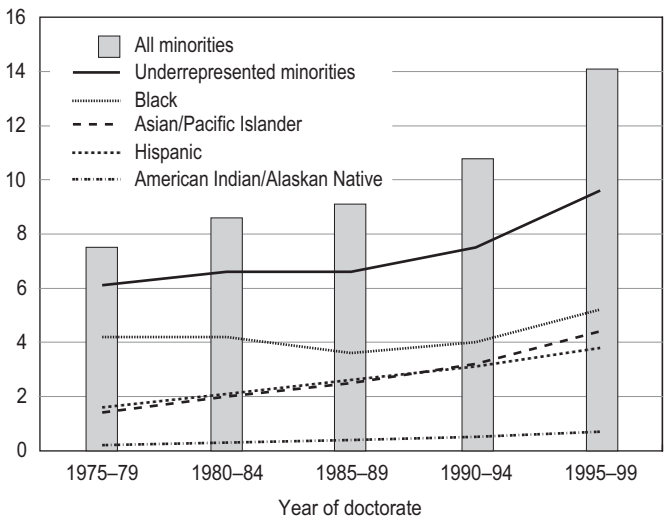
[7] Discussions of race/ethnicity in this report refer to U.S. citizens only unless stated otherwise.

FIGURE 3-12. Ethnicity of U.S. citizen Hispanic Ph.D.s: 1980–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-13. Minorities' share of doctorates earned by U.S. citizens, by race/ethnicity: 1975–99

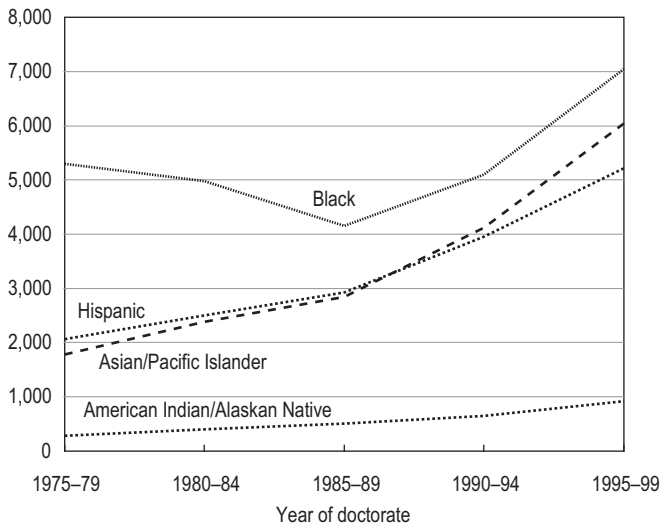


NOTE: Underrepresented minorities are American Indians/Alaskan Natives, blacks, and Hispanics.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

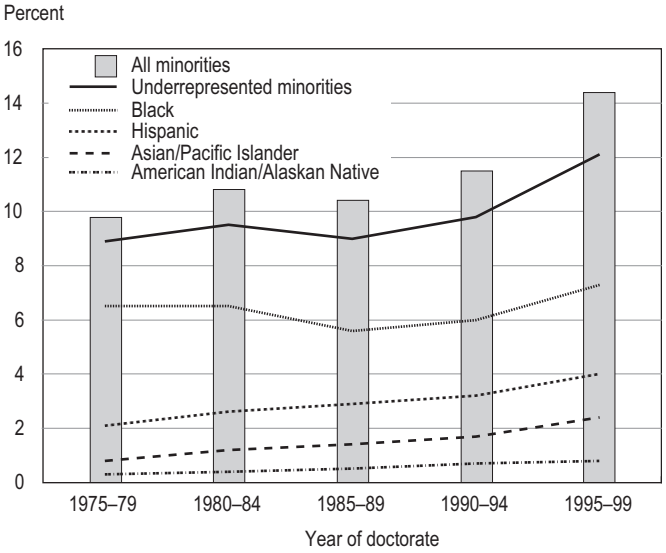
Over the last quarter of the century, the share of Ph.D.s earned by women increased in every racial/ethnic group among U.S. citizens (figure 3-17). Women's share of doctorates earned in 1995–99 was largest among blacks (nearly 62 percent) and smallest among Asians/Pacific Islanders and whites (43 percent and 46 percent, respectively). Women earned slightly over half of all doctorates awarded to Hispanics and slightly under half of all doctorates awarded to American Indians/Alaskan Natives.

FIGURE 3-14. U.S. citizen minority Ph.D.s, by race/ethnicity: 1975–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-15. Minorities' share of non-science and engineering doctorates earned by U.S. citizens, by race/ethnicity: 1975–99



NOTE: Underrepresented minorities are American Indians/Alaskan Natives, blacks, and Hispanics.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 3-5. Major field distribution of U.S. citizen Ph.D.s, by race/ethnicity: 1995–99

Field	American Indian/ Alaskan Native	Asian/Pacific Islander	Black	Hispanic	White
All fields	910	6,039	7,048	5,218	117,392
	Percent distribution				
All fields	100.0	100.0	100.0	100.0	100.0
Science and engineering	50.2	76.6	38.5	55.0	56.9
Agricultural sciences	2.6	1.1	0.9	1.3	1.8
Biological sciences	8.1	21.1	6.8	12.1	13.1
Earth, atmospheric, and ocean sciences	1.4	0.9	0.4	1.3	1.9
Mathematics and computer sciences	1.9	5.7	1.3	2.5	3.6
Physical sciences	4.7	10.8	3.3	5.2	7.7
Psychology	12.9	7.7	10.7	16.3	11.2
Social sciences	11.3	7.3	10.0	8.6	9.0
Engineering	7.3	22.0	5.1	7.6	8.7
Non-science and engineering	49.8	23.4	61.5	45.0	43.1
Education	28.8	8.0	41.7	23.2	19.4
Health sciences	3.2	2.9	3.7	3.2	3.5
Humanities	10.7	8.2	8.7	14.2	14.5
Professional fields/other	1.8	4.3	7.3	4.4	5.7

NOTE: Detail may not add to total because of rounding.

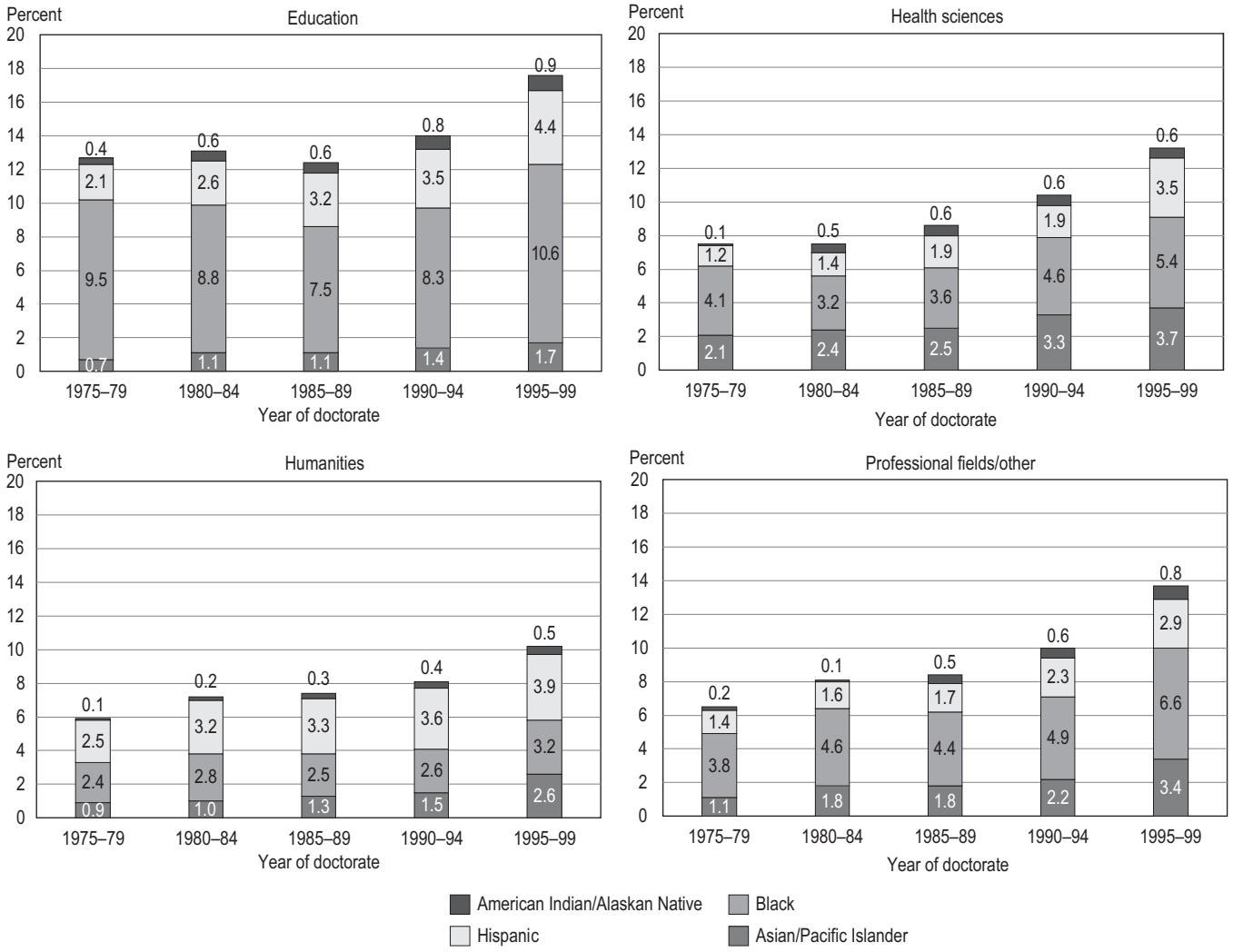
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Age

Variations in the age at which persons receive the doctorate reflect many factors, including field of study, sex, age at baccalaureate graduation, the time it takes to complete requirements for the doctorate, and educational and career choices made at different stages, which may postpone or interrupt the path to the doctorate.

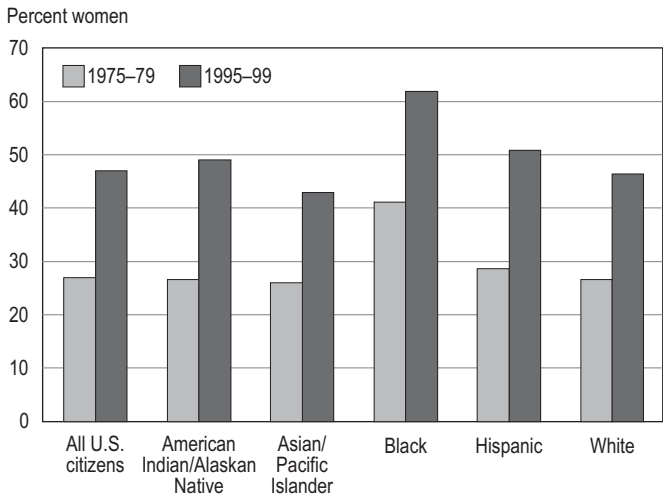
When students pursue their undergraduate education on a part-time basis, they are likely to take longer than 4 years to earn the bachelor's degree. If a substantial number of students follow this pattern, the average age of baccalaureate recipients, and hence doctorate recipients, will rise. Moreover, many students who eventually pursue a doctorate do not enter graduate school immediately after receiving a bachelor's or master's degree. Many graduates enter the workforce and only later decide to undertake doctoral studies. In some fields, such as education, specific kinds of work experience may be required before the doctorate is awarded. These factors, among others, contribute to the total elapsed time between receipt of the baccalaureate and receipt of the doctorate.

FIGURE 3-16. Minorities' share of non-science and engineering doctorates earned by U.S. citizens, by major field and race/ethnicity: 1975–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-17. Women's share of doctorates earned by U.S. citizens, by race/ethnicity: 1975–79 and 1995–99

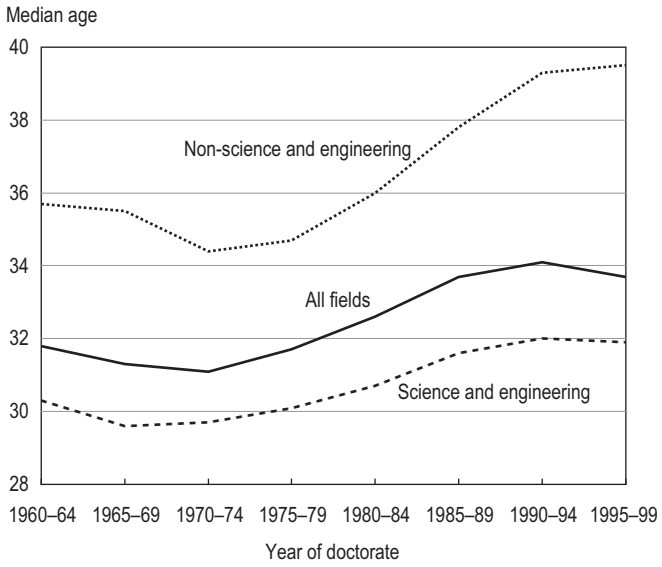


SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

During the 1950s and 1960s, concerted efforts were made to reduce the time required to earn a doctorate, and the data indicate that there were declines in the age of new Ph.D.s during that era. Between 1970 and 1999, however, the age of Ph.D.s at graduation rose (figure 3-18). Doctoral students graduating in 1995–99 were, on average, nearly 34 years old, almost 2 years older than those graduating in 1960–64. Reflecting variations by field, recipients of doctorates in S&E fields were substantially younger than their non-S&E colleagues throughout this period, and the differences in their ages increased beginning in 1975–79.

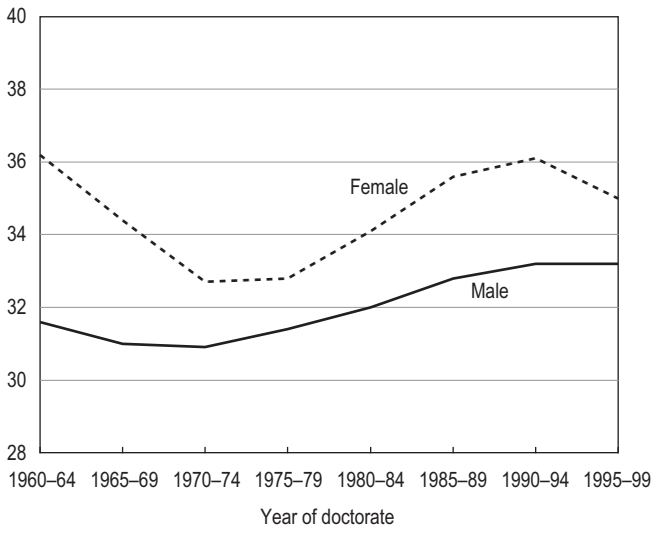
Over the 40-year period from 1960 to 1999, the difference between the ages of men and women at graduation narrowed. In 1960–64 female Ph.D.s were almost 5 years older than male Ph.D.s, but by 1995–99 the gap between the average ages of male and female Ph.D.s was less than 2 years (figure 3-19).

FIGURE 3-18. Age of Ph.D.s at graduation, by broad field of doctorate: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-19. Age of Ph.D.s at graduation, by sex: 1960–99



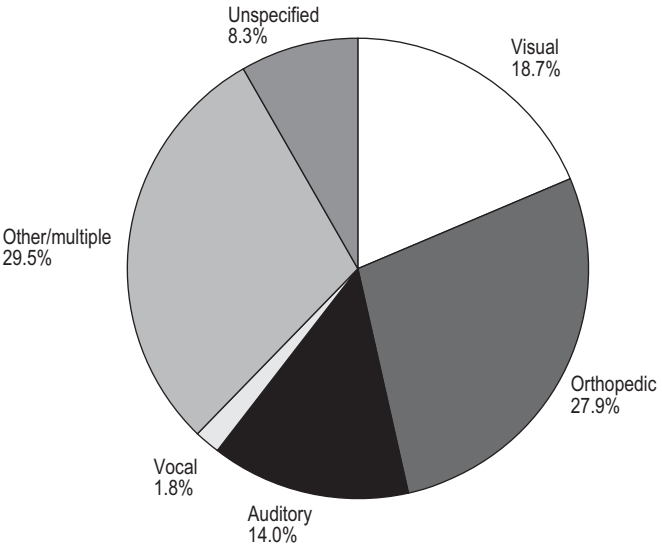
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Disability Status

Statistics on the disabilities of Ph.D. recipients began being collected in the SED in 1993. Nearly 4,700 individuals with self-reported disabilities were awarded doctorates between 1993 and 1999—accounting for close to 2 percent of all doctorates awarded in that period, substantially below the percentage of disabled persons in the U.S. population. In 1997 about 13 percent of the U.S. population 22 to 44 years old had some kind of disability, and nearly 8 percent were severely disabled (U.S. Census Bureau 2000, table 222).

Among Ph.D.s graduating in 1993–99, orthopedic (mobility) disabilities were the most common, reported by 28 percent of those with disabilities, followed by visual (19 percent) and auditory (14 percent) disabilities. Very few of these new graduates had vocal disabilities (figure 3-20).

FIGURE 3-20. Disabilities of Ph.D.s: 1993–99, aggregate



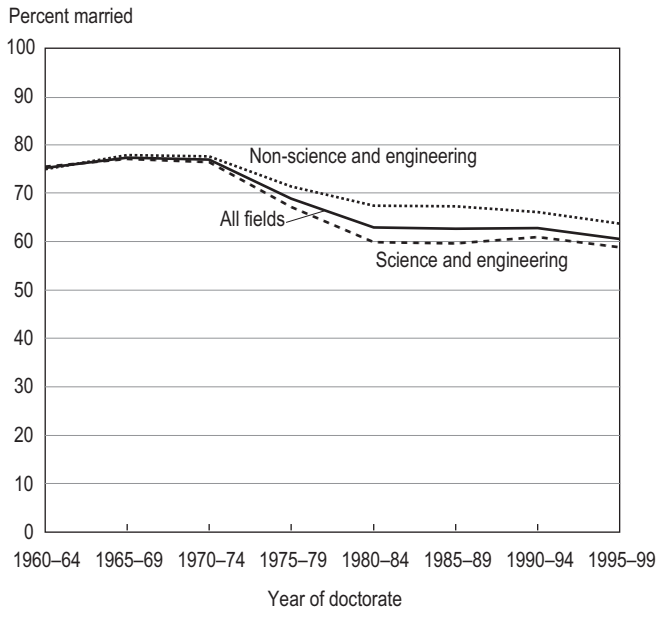
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Marital Status and Dependents

Overall, individuals who earned doctorates at the end of the century were less likely to be married or to have dependents (children or adult dependents) than were those who graduated 40 years earlier. In every 5-year period from 1960–64 to 1995–99, a majority of Ph.D.s were married at the time of their graduation; however, the proportion of married graduates fell from about 75 to 60 percent between the early 1960s and late 1990s. (figure 3-21). Men were more likely than women to be married, but this gap began to narrow in the 1980s. Although the percentage of graduates who were married has decreased both overall and among U.S. citizens since 1960–64, particularly among men, it has increased slightly among permanent and temporary residents (figure 3-22).

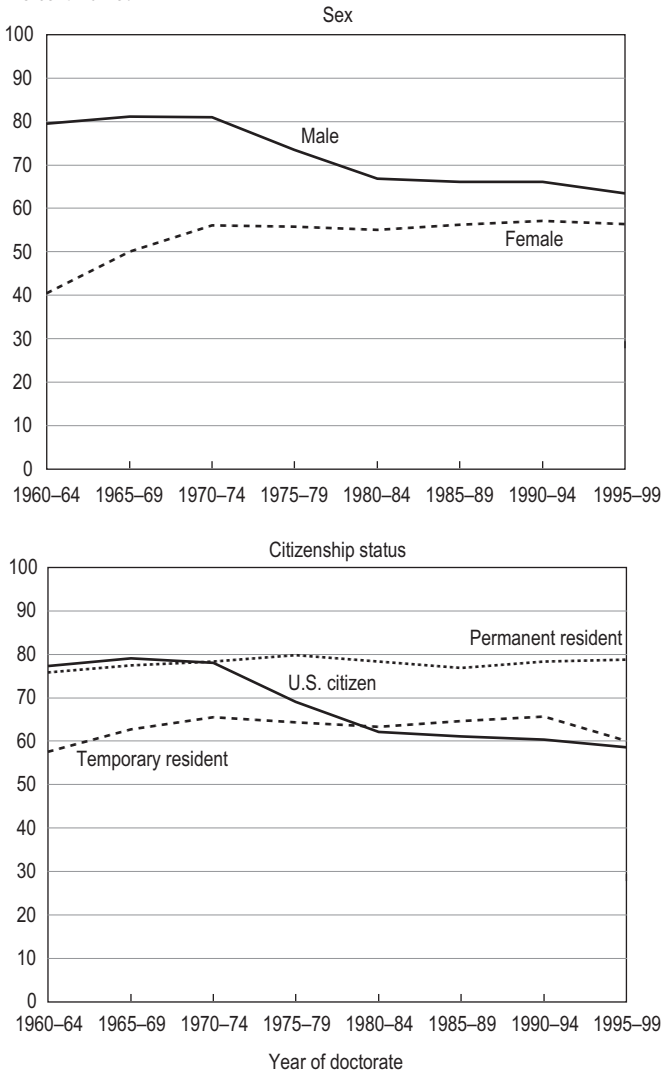
The percentage of Ph.D.s (regardless of marital status) who had dependents at the time the doctorate was received declined from 76 percent in 1960–64 to 48 percent in 1995–99, with men in both periods being more likely than women to have dependents (figure 3-23). Women who received doctorates in 1995–99 were more

FIGURE 3-21. Married Ph.D.s, by broad field of doctorate: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-22. Married Ph.D.s, by sex and citizenship status: 1960–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

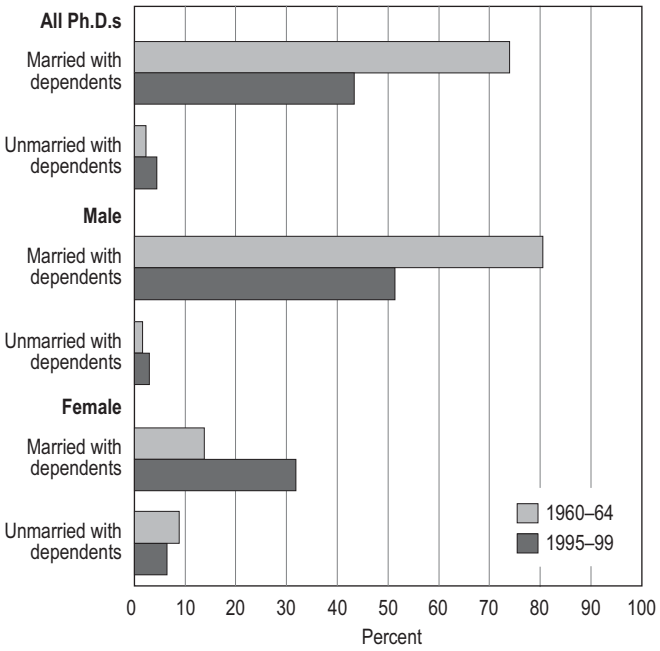
likely to be married and to have children or other dependents than were women who graduated in 1960–64 (figures 3-22, 3-23). Declines in both married graduates and graduates with dependents were greater among recipients of doctorates in S&E fields than among those who received doctorates in non-S&E fields.

The percentage of Ph.D.s who were married at the time of their graduation declined in every U.S. racial/ethnic group after 1975–79 (figure 3-24). The percentages of whites and American Indians/Alaskan Natives who were married stabilized in the 1980s, but the percentages of married Asians/Pacific Islanders, blacks, and Hispanics were still falling at the end of the century.

Parents' Education

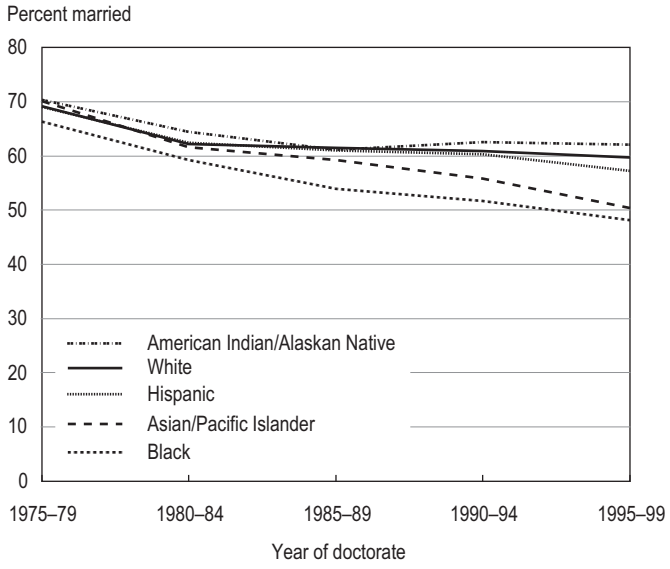
Rising educational attainment in the U.S. population as a whole is reflected in the Ph.D. population. Data on the educational attainment of the parents of Ph.D.s became available in 1965. On the whole, the level of educational attainment for families of doctorate recipients is higher than the national average. By 1995–99 more than one-third (nearly 35 percent) of new Ph.D.s came from families in which both the mother and the father had a college degree (figure 3-25). Nearly half of doctorate recipients in 1999 had a parent who held a bachelor's or advanced degree, compared with less than one-fifth of parent equivalents (those 55 or older, the assumed age of Ph.D.s' parents) in the U.S. population (figure 3-26). In contrast, 30 years earlier, almost half of new Ph.D.s came from families in which neither parent had attended college. Among doctorate recipients in general, the father's educational level was higher than the mother's (figure 3-27).

FIGURE 3-23. Marital status of Ph.D.s with dependents, by sex: 1960–64 and 1995–99



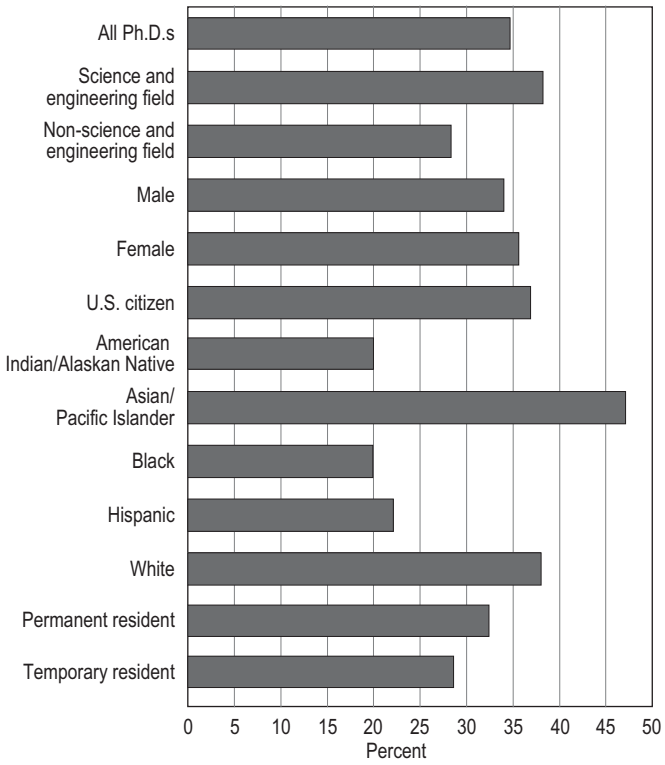
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-24. Married U.S. citizen Ph.D.s, by race/ethnicity: 1975–99



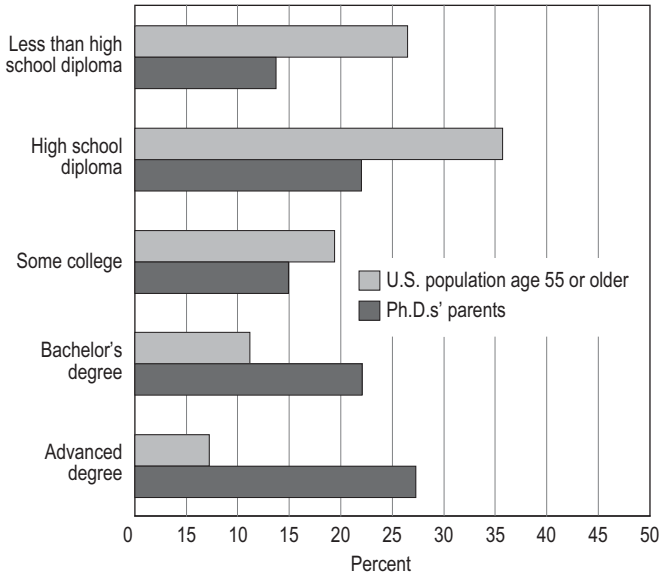
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 3-25. Ph.D.s whose parents both have a college degree, by selected characteristics of the Ph.D.: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

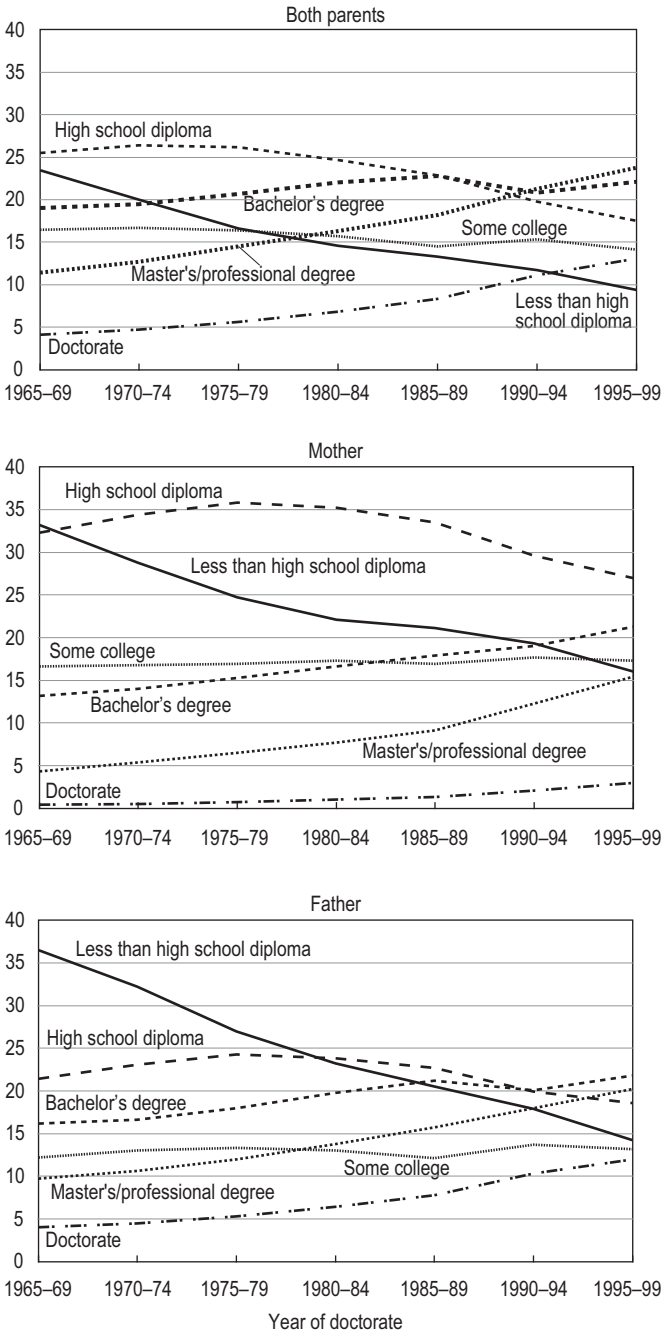
FIGURE 3-26. Educational attainment of Ph.D.s' parents compared with the U.S. national population: 1999



NOTES: To be most comparable to national data collected by the U.S. Census Bureau, educational attainment is counted for both parents of Ph.D.s who received their degree in 1999. A generation is traditionally defined as 30 years; thus, parents are assumed to be 30 years old when their child is born. Ph.D.s are assumed to be age 25 or older at graduation; the parent of a 25-year old Ph.D. is assumed to be 55 or older when the child receives the doctorate.

SOURCES: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File (Ph.D.s' parents); U.S. Census Bureau, *Statistical Abstract of the United States: 2000* (120th edition), table 251.

FIGURE 3-27. Educational attainment of Ph.D.s' parents: 1965–99



NOTES: For both parents, the parent with the higher educational attainment is counted; thus, If the mother has a bachelor's degree and the father has a master's degree, only the father's educational attainment is counted. If both parents have the same level of educational attainment, one count is made for that level.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

REFERENCES

National Science Board (NSB). 2002. *Science and Engineering Indicators 2002*. 2 vols. NSB-02-1. Arlington, VA: National Science Foundation.

National Science Foundation (NSF). 2002. *Science & Engineering Degrees, 1966–2000*, table 46. NSF 02-327. Arlington, VA.

Quintana-Baker, M. 2002. A profile of Mexican American, Puerto Rican, and other Hispanic STEM doctorates: 1983–1997. *Journal of Women and Minorities* 8:99–121.

U.S. Census Bureau. 2000. *Statistical Abstract of the United States: 2000*. 120th ed., tables 222, 251. Washington, DC.

Chapter 4. Path to the Doctorate

Highlights

- **Attendance at 2-Year Colleges.** About 9 percent of all Ph.D.s who received doctorates in 1975–84 had attended a 2-year college. By the late 1990s this proportion was 8 percent, perhaps because of an increase in the number of foreign nationals, mostly men, seeking doctorates from U.S. institutions. In the 1995–99 cohort of doctorate recipients, women were more likely than men to have attended 2-year colleges. The opposite was true in the 1970s.

- **Baccalaureates, Master's Degrees, and Professional Degrees.** Most Ph.D.s earned both a baccalaureate and a master's degree before the doctorate, and most of those degrees were earned in the United States.

  As the number of foreign nationals earning doctorates in the United States increased, so did the numbers of doctoral students holding degrees from foreign institutions. By 1995–99, 28 percent of Ph.D.s held baccalaureates from foreign institutions.

- **Fields of Baccalaureate, Master's Degree, and Doctorate.** Between 1960 and 1999, two in three Ph.D.s earned a doctorate in the same major field as their baccalaureate, and four in five stayed in the same field as their master's degree.

- **Financial Support.** About 57 percent of Ph.D.s graduating in 1980–81 and about 58 percent of those graduating in 1996–97 received most of their financial support from research and teaching assistantships, fellowships, traineeships, internships, and dissertation grants provided by federal agencies, associations, academic institutions, and other organizations.

- **Activities in Year before Receiving Doctorate.** The proportion of doctoral students employed full time in the year before graduation decreased from 44 to 35 percent between 1970–74 and 1995–99, whereas part-time employment increased from 5 to 12 percent.

  As the numbers of foreign Ph.D.s grew, assistantships became more common and fellowships less common in the year before graduation.

- **Indebtedness.** In 1999, for the first time, more than 50 percent of graduating Ph.D.s reported having debt related to their undergraduate and graduate education. At the end of the century, the percentage of Ph.D.s who owed more than $20,000 in education-related debt at graduation was about 20 percent, compared with less than 7 percent in the late 1980s.

- **Time to Doctorate.** Between 1920–24 and 1995–99 the median total time between receipt of the baccalaureate and receipt of the doctorate (TTD) rose from 7 to almost 11 years. The gap between men's and women's TTD narrowed. Men's TTD increased 2 years between 1960–64 and 1995–99, to 10 years, whereas women's TTD remained at about 12 years.

Introduction

For students whose ultimate goal was to earn the doctorate, opportunities and options expanded in the second half of the 20th century. Many doctorate recipients still went directly from secondary schools to full-time study at 4-year colleges or universities for the baccalaureate, then immediately to universities with long-established graduate programs for full-time doctoral study. That pattern began to change, however, in the years following World War II. Some of the factors that influenced the path to the doctorate were structural changes in U.S. higher education, draft deferments during the Vietnam War, more postbaccalaureate options, consequences of the changed mix of U.S. graduate students, and growing internationalization of U.S. doctoral education. This chapter reviews the undergraduate and graduate experiences of Ph.D.s.

Attendance at 2-year Colleges

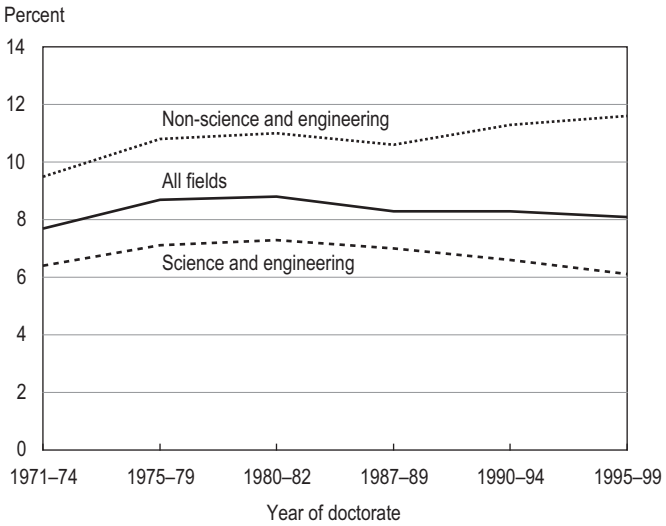
The rapid expansion of 2-year colleges during the second half of the 20th century brought opportunity for higher education closer to most high school graduates. Low tuition costs and flexible schedules, designed to accommodate both part-time and full-time students,

drew large numbers of students. By 1972 these institutions were enrolling the majority of first-time college freshmen, and they did not relinquish that lead until 1986 (USED/NCES 2002, table 182). In fall 1999, 45 percent of first-time college freshmen were attending 2-year colleges.

About 9 percent of all Ph.D.s who graduated in the late 1970s and early 1980s reported that they had attended 2-year colleges, a slightly higher percentage than in the early 1970s (figure 4-1). The percentage of S&E Ph.D.s reporting attendance at 2-year colleges decreased in the late 1980s and the 1990s, whereas the percentage of non-S&E Ph.D.s increased except for a brief period during the 1980s. In 1995–99 non-S&E Ph.D.s were almost twice as likely as their colleagues in S&E fields to have attended 2-year colleges (12 percent compared with 6 percent, respectively); for Ph.D.s in all fields the figure was 8 percent. By major field, percentages ranged from a high of 15 percent in education to a low of 4 percent in engineering (figure 4-2).

Trends in the proportions of Ph.D.s reporting attendance at 2-year colleges were affected by the growing presence of foreign nationals receiving doctorates from U.S. institutions. The surge in male foreign students during the 1980s and 1990s was undoubtedly a factor in the percentage of male Ph.D.s who attended a 2-year college (figure 4-3). By 1995–99 attendance at a 2-year college among those who received doctorates was more common for women than for men (9 percent compared

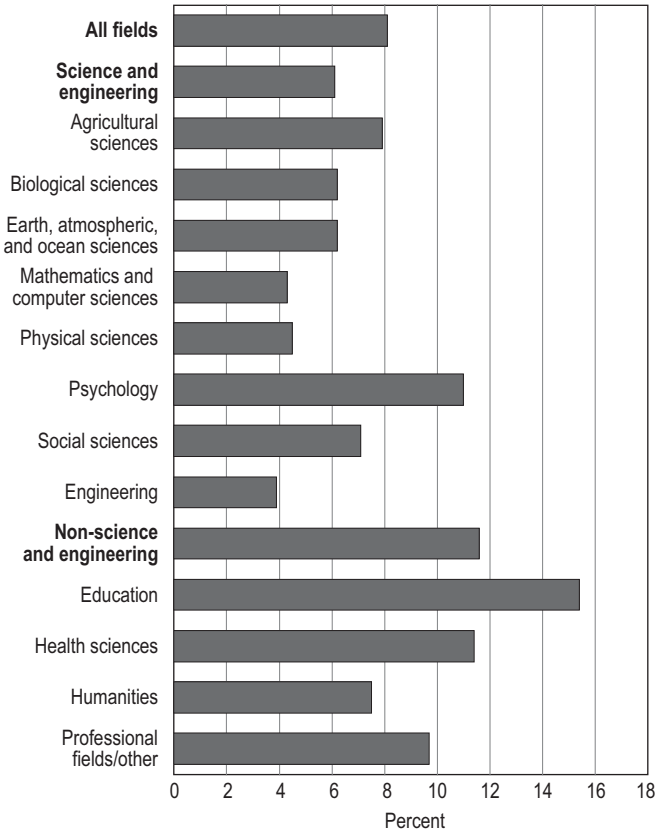
FIGURE 4-1. Ph.D.s who ever attended a 2-year college, by broad field of doctorate: 1971–99



NOTE: Two-year college attendance was not recorded in all years. The 1971–74, 1980–82, and 1987–89 periods include less than 5 years.

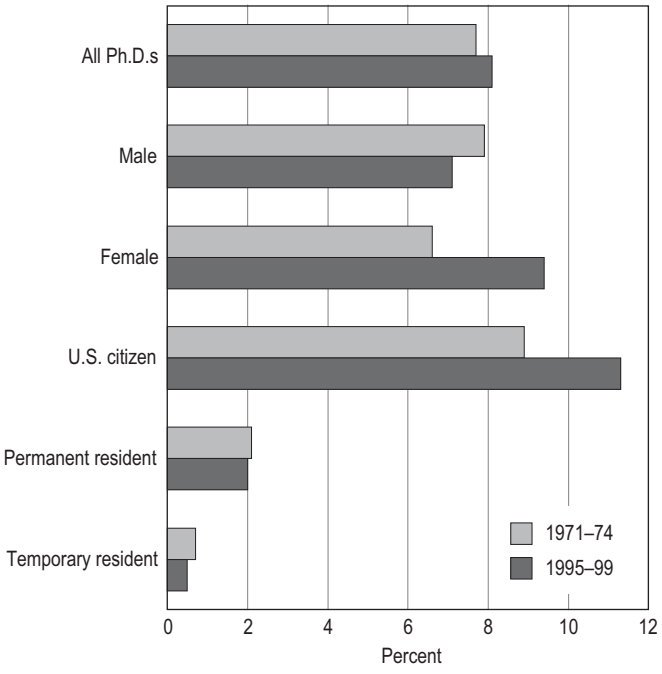
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-2. Ph.D.s who ever attended a 2-year college, by major field of doctorate: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-3. Ph.D.s who ever attended a 2-year college, by sex and citizenship status: 1971–74 and 1995–99



NOTE: Two-year college attendance was not recorded in 1970.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

with 7 percent, respectively), whereas the opposite was true in the early 1970s.

More than 11 percent of all U.S. citizens awarded doctorates in 1995–99 had attended 2-year colleges, up from about 10 percent in the late 1970s (figure 4-4). Reports of attendance at 2-year colleges increased for American Indians/Alaskan Natives, blacks, and whites. These colleges played an especially prominent role in the education of American Indians/Alaskan Natives and Hispanics who eventually earned doctorates. More than one-fifth (22 percent) of American Indians/Alaskan Natives and about one-sixth (16 percent) of Hispanics who received doctorates in 1995–99 reported attendance at 2-year colleges (for Hispanics who received doctorates in 1975–79, the proportion was even higher, 21 percent). The percentages for blacks and whites were lower; the figure was lowest for Asians/Pacific Islanders (about 6 percent of those graduating in 1995–99, down from 8 percent in 1975–79).

Baccalaureates, Master's Degrees, and Professional Degrees

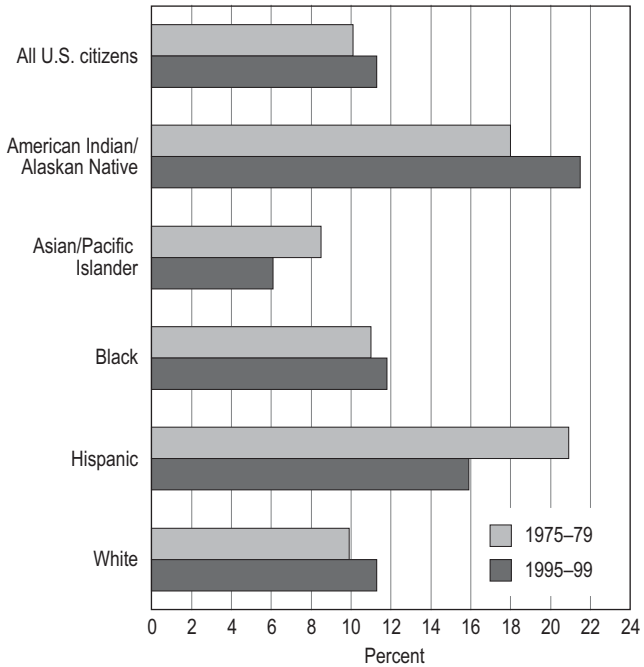
Throughout the 20th century, most Ph.D.s earned both a baccalaureate and a master's degree before earning the doctorate, and most of those degrees were conferred in the United States. As the number of foreign nationals earning U.S. doctorates increased, so did the number of U.S. doctoral students holding baccalaureates and master's degrees from foreign institutions. Some U.S. citizens, mostly naturalized citizens, also received baccalaureates and master's degrees from foreign institutions. More than one-fourth (28 percent) of Ph.D.s graduating in 1995–99, mainly foreign nationals, held baccalaureates from institutions outside the United States (figure 4-5). About 90 percent of temporary resident Ph.D.s had earned their baccalaureates at foreign institutions.

Because non-U.S. citizens tend to be concentrated in S&E fields, Ph.D.s who hold baccalaureates from foreign institutions are generally more common in S&E fields than in non-S&E fields. In 1995–99, 35 percent of S&E Ph.D.s had foreign baccalaureates, compared with 15 percent of non-S&E Ph.D.s (figure 4-6).

About 90 percent of Ph.D.s graduating in 1995–99 earned a master's degree before the doctorate; however, in many institutions a master's degree is not a prerequisite. Requirements for a master's degree also vary by field of study. For example, in 1995–99, 38 percent of Ph.D.s in chemistry, a specialty within the major field of physical sciences, and 37 percent of those in biological sciences did not hold master's degrees, compared with less than 1 percent of those in education (figure 4-7).

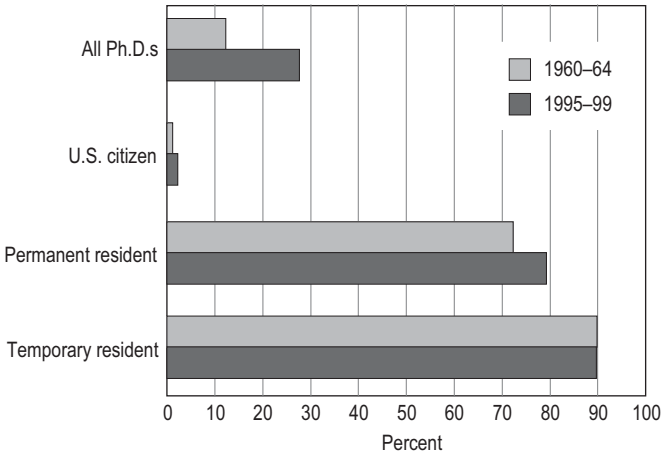
Some doctorate recipients participate in programs that lead to dual degrees—the Ph.D. and a professional degree, such as the M.D. Others obtain professional degrees before receiving the doctorate. The percentage of Ph.D.s who earned professional degrees either

FIGURE 4-4. U.S. citizen Ph.D.s who ever attended a 2-year college, by race/ethnicity: 1975–79 and 1995–99



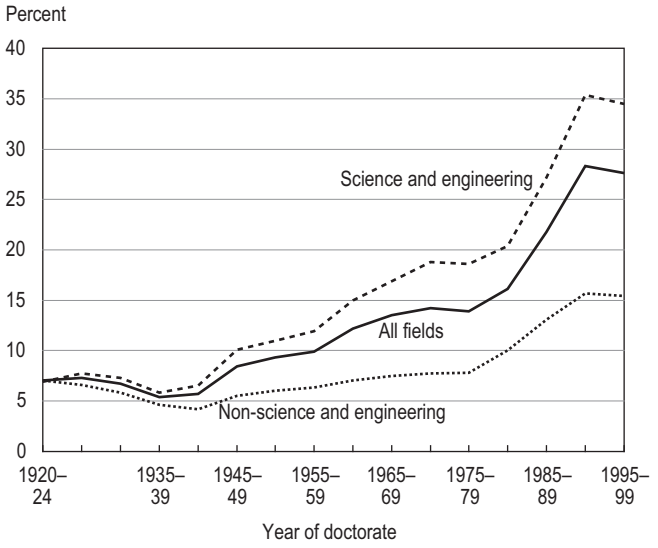
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-5. Ph.D.s with baccalaureates from foreign institutions, by citizenship status: 1960–64 and 1995–99



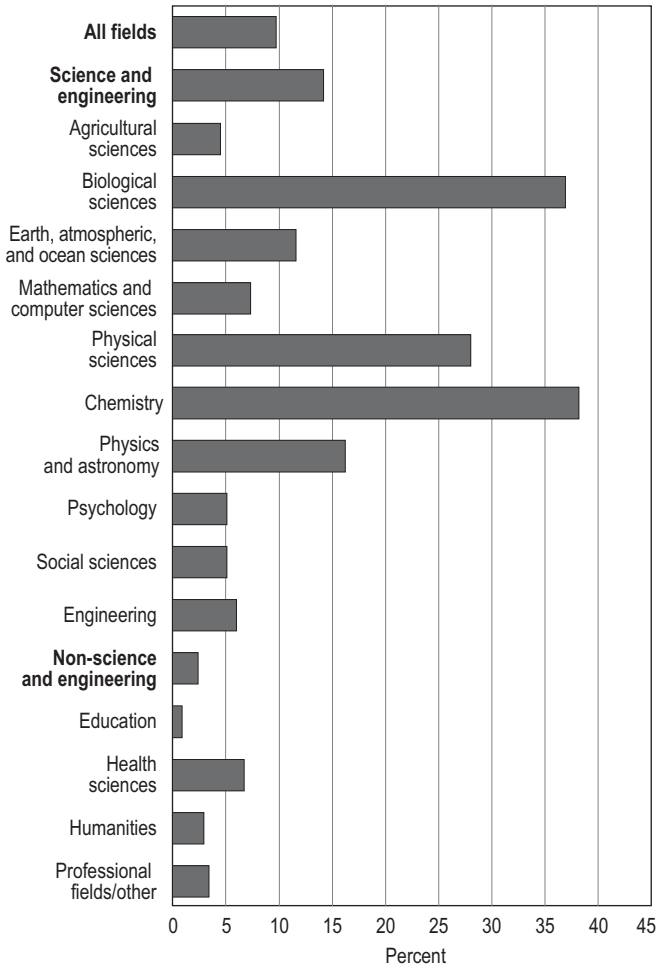
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-6. Ph.D.s with baccalaureates from foreign institutions, by broad field of doctorate: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-7. Ph.D.s without master's degrees, by major field of doctorate: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

before or concurrently with the doctorate, although remaining small, doubled from 1 percent of Ph.D.s in 1960–64 to 2 percent in 1995–99.[1]

Fields of Baccalaureate, Master's Degree, and Doctorate

A retrospective view of the educational background of Ph.D.s provides insights into differing traditions across fields of study. The top fields at the doctoral level (in terms of number of Ph.D.s) are not the top baccalaureate and master's degree fields of Ph.D.s. Historically, humanities has been the leading baccalaureate field of Ph.D.s, whereas education has been the leading doctoral field. Although two in three Ph.D.s earn their baccalaureate and doctorate in the same field, no doctoral field is built solely on baccalaureates from that same field.

Field switching between master's degree and doctoral fields occurs less often than it does between baccalaureate and doctoral fields. About four in five Ph.D.s with master's degrees stay in the same field for the doctorate.

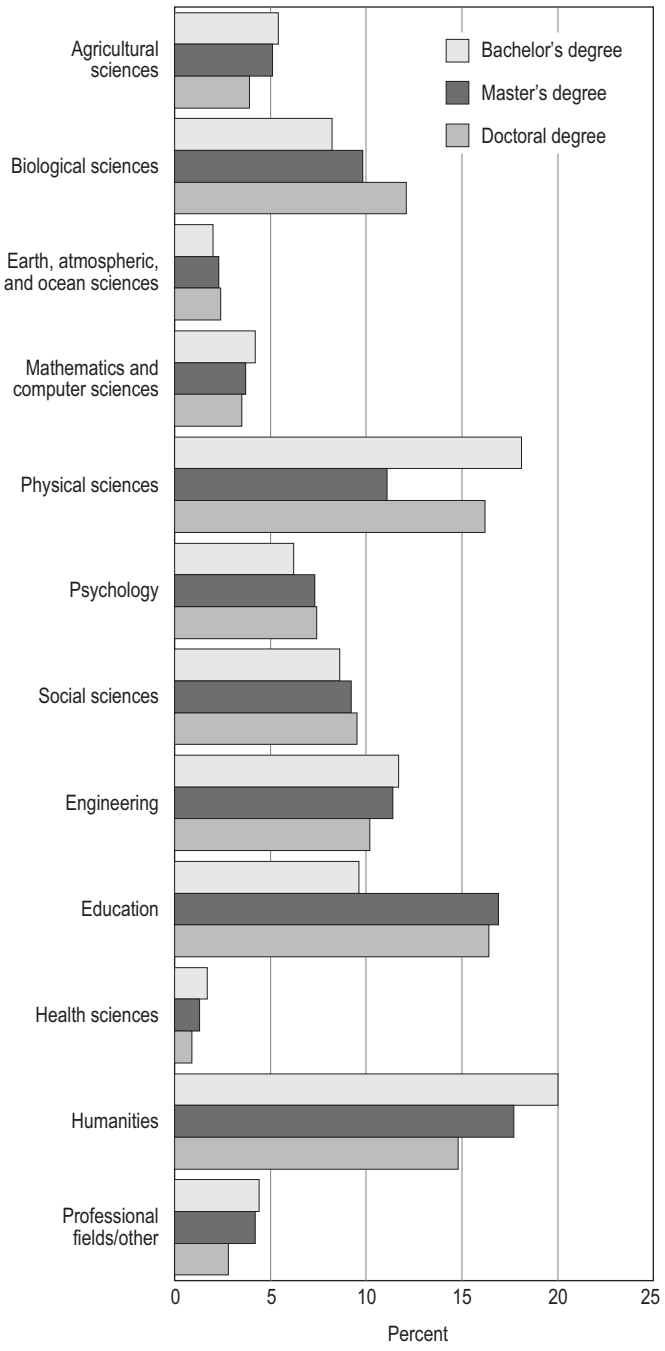
Top Fields

The top fields of study of doctorate recipients at each degree level were the same at the end of the century as they had been in the early 1960s. Humanities has been the largest baccalaureate field of Ph.D.s: 20 percent of the 1960–64 cohort and 16 percent of the 1995–99 cohort held bachelor's degrees in humanities (figures 4-8, 4-9). The top three master's degree fields of Ph.D.s in both 1960–64 and 1995–99 were humanities, education, and engineering.

Education was the top doctoral field of Ph.D.s in 1960–64 and remained the top field in 1995–99, accounting for about 16 percent of doctorates in both periods. Other fields that accounted for more than one-tenth of doctorates in both periods were humanities, biological sciences, and engineering. The field of social sciences accounted for nearly one-tenth (10 percent) of doctorates in both periods.

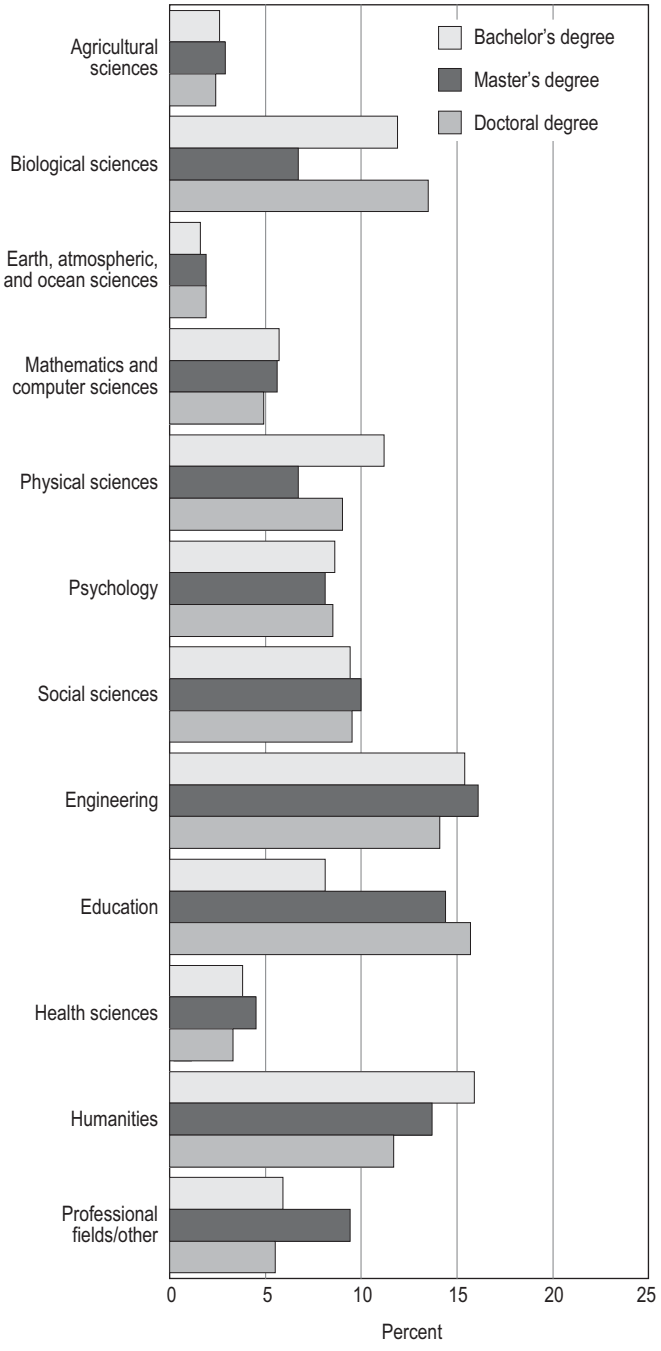
[1] Some Ph.D.s in dual-degree programs may have received the professional degree after the doctorate, and other Ph.D.s may have later independently pursued a professional degree. Only professional degrees that were received by the time the doctorate was conferred are recorded in the Doctorate Records File, and thus only those professional degrees are included in the data presented in this report.

FIGURE 4-8. Major field of Ph.D.s' bachelor's, master's, and doctoral degrees: 1960–64



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-9. Major field of Ph.D.s' bachelor's, master's, and doctoral degrees: 1995–99



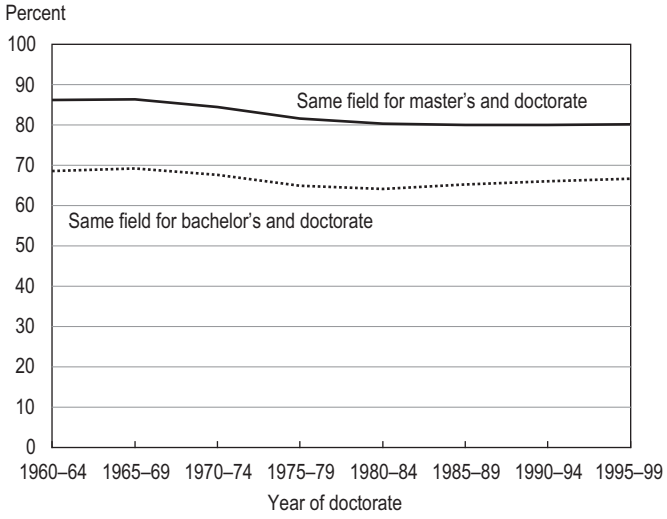
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Field Switching

Even though some fields are larger at the baccalaureate and master's degree levels and others are larger at the doctorate level of study, in every year since 1960, about two-thirds of Ph.D.s earned their bachelor's degree and doctorate in the same major field (figure 4-10). Even less field switching occurred between the master's degree and the doctorate.

Reasons for field switching may include the emergence of new fields, such as computer sciences, and the relation of a baccalaureate to a doctoral field. In the cases of education and professional and other fields, the doctorate adds competencies to complement degrees in subject-area fields. In 1995–99 more than one-half of the doctorates in computer sciences, education, and professional and other fields were awarded to individuals

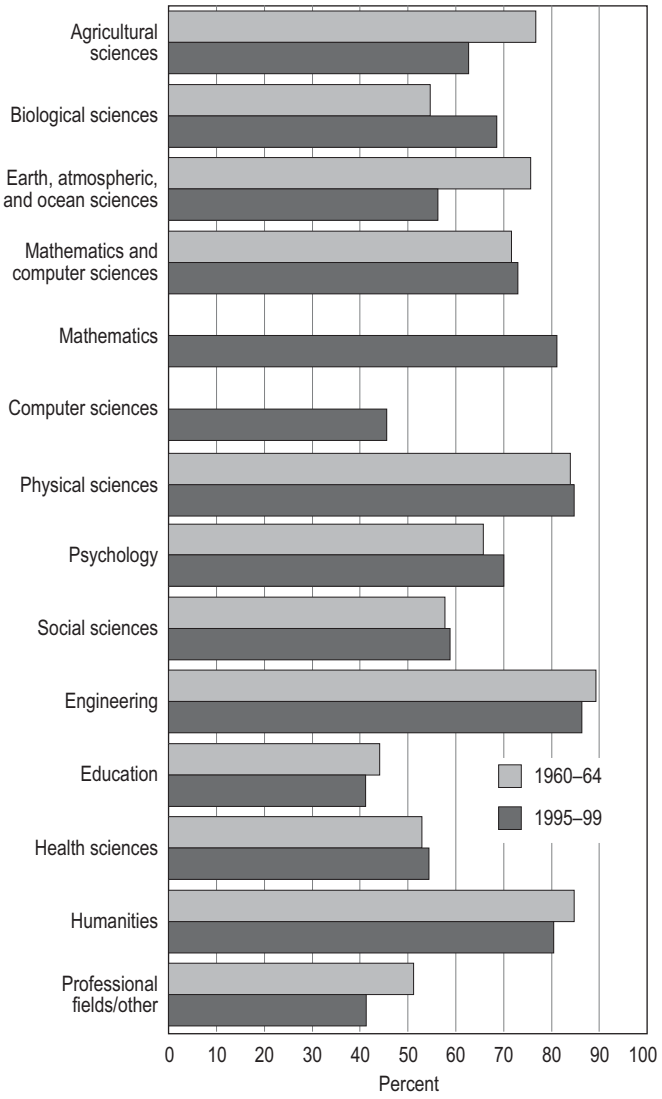
FIGURE 4-10. Ph.D.s whose bachelor's and doctoral degrees are in the same major field and whose master's and doctoral degrees are in the same major field: 1960–99



NOTE: Percentages are based on number of Ph.D.s in doctoral field. Subfields of physical sciences and subfields of mathematics and computer sciences were not broken out from their respective major field.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-11. Ph.D.s with bachelor's and doctoral degrees in the same major field, by field of degree: 1960–64 and 1995–99



NOTES: Percentages are based on number of Ph.D.s in doctoral field or in subfields of mathematics and computer sciences or subfields of physical sciences. Computer sciences did not become a separate field in the SED until the late 1970s.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

whose bachelor's degrees were not in those fields (figure 4-11). The pattern was similar in the 1960–64 cohort.

Men switched fields between the baccalaureate and the doctorate less often than women did. The amount of field switching by men and women changed little between the early 1960s and the late 1990s (figure 4-12). In each of the three citizenship groups, however, changes did occur. In the 1960–64 Ph.D. cohort, temporary residents were more likely than U.S. citizens and permanent residents to have switched fields between the bachelor's degree and the doctorate, but by 1995–99, temporary residents exhibited the least field switching.

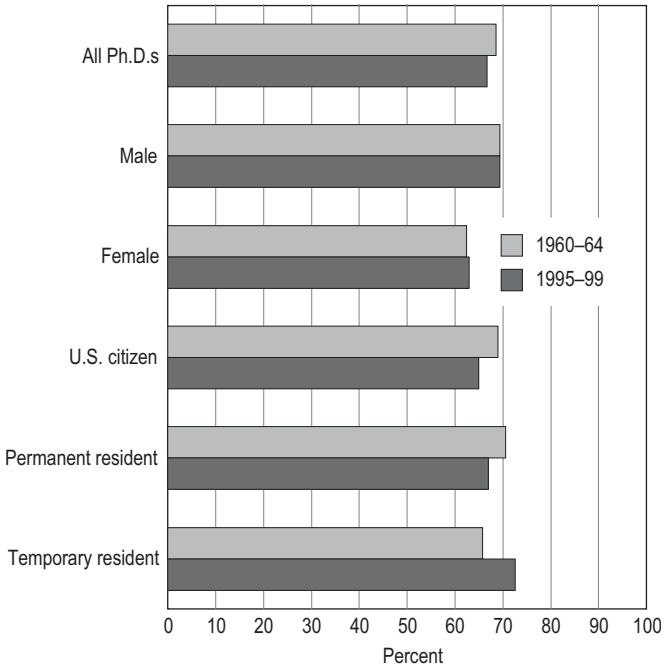
Among U.S. citizens, Asians/Pacific Islanders switched fields the least and blacks the most; about 70 percent of Asians/Pacific Islanders in the 1995–99 Ph.D. cohort earned their bachelor's degree and doctorate in the same field, compared with 56 percent of blacks (figure 4-13). Corresponding figures for the other U.S. racial/ethnic groups ranged from 63 to 65 percent. There was more field switching among Asians/Pacific Islanders, Hispanics, and whites in 1975–79 than in 1995–99.

Top Baccalaureate Fields Associated with Major Doctoral Fields

The top three baccalaureate fields associated with each major doctoral field are shown in table 4-1. The first-ranked baccalaureate field associated with a doctoral field is consistently that same field. The baccalaureate field ranked second is usually one closely related to the doctoral field. These patterns have changed little since 1960–64. Among the few changes in 1995–99 are the appearance of biological sciences in the lists of top three baccalaureate fields for the field of chemistry and the field of earth, atmospheric, and ocean sciences.

Although there is less field switching between the master's degree and the doctorate, engineering provides a good illustration of the kind of switching that can take place during graduate studies. Engineering master's degrees were common among S&E Ph.D.s in the 1995–99 cohort. In addition to being the primary master's degree

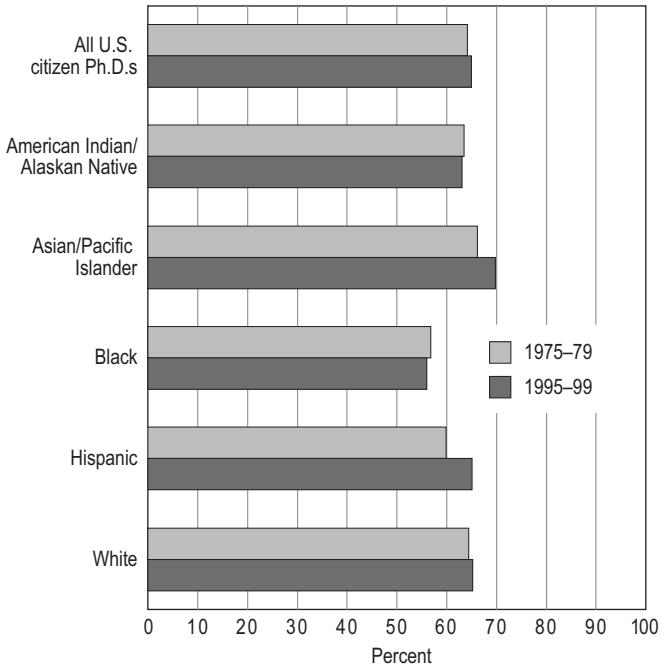
FIGURE 4-12. Ph.D.s with bachelor's and doctoral degrees in the same major field, by sex and citizenship status: 1960–64 and 1995–99



NOTES: Percentages are based on number of Ph.D.s in doctoral field. Subfields of physical sciences and subfields of mathematics and computer sciences were not broken out from their respective major field.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-13. U.S. citizen Ph.D.s with bachelor's and doctoral degrees in the same major field, by race/ethnicity: 1975–79 and 1995–99



NOTES: Percentages are based on number of Ph.D.s in doctoral field. Subfields of physical sciences and subfields of mathematics and computer sciences were not broken out from their respective major field.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

field of engineering Ph.D.s (91 percent), engineering was the second largest master's degree field of Ph.D.s in the fields of physics and astronomy (6 percent); chemistry (6 percent); earth, atmospheric, and ocean sciences (6 percent); mathematics (3 percent); and computer sciences (12 percent).

Financial Support

The availability of financial support influences students' decisions about whether to pursue degrees beyond the baccalaureate. The kind of support available to students also affects the time it takes to complete additional degrees. Most doctoral students rely on several kinds of support for their graduate education. A study of S&E Ph.D.s who graduated in 1995 found that doctorate recipients used an average of 2.5 modes of support during graduate school (NSF 2000). More than 40 percent of these S&E Ph.D.s relied on three or more different sources of support, whereas 16 percent received support from only one source. The number of sources and the kinds of support used by these Ph.D.s varied by field of doctorate, sex, citizenship status, and race/ethnicity. Research assistantships, teaching assistantships, and personal resources mixed in a variety of ways to form the most common combinations of support for S&E Ph.D.s graduating in 1995.

Source-of-support questions in the SED have been changed several times, resulting in multiple code schemes that prevent the use of all source-of-support data in examining long-term trends. Information about the primary source of support, however, comes from a separate item and is coded consistently in the database, allowing a limited analysis of primary sources over time (because of survey changes, this analysis must be restricted to the 1980–81, 1996–97, and 1998–99 Ph.D. cohorts[2]).

The majority of Ph.D.s receive their primary support from federal agencies, associations, academic institutions, and other organizations through such mechanisms as research and teaching assistantships, fellowships, traineeships, internships, and dissertation grants. The number of students supported by each of these mechanisms has varied over the years, but the cumulative percentage of students supported by all such mechanisms has remained close to 60 percent among the cohorts

[2] Information on all modes of support can be found in the annual summary reports of SED survey results (NORC 1998–2002, NAS/NRC 1968–98).

TABLE 4-1. Top 3 baccalaureate fields associated with major field of doctorate: 1960–64 and 1995–99

	Doctorate received 1960–64		Doctorate received 1995–99	
Doctorate field	Baccalaureate field	Percent	Baccalaureate field	Percent
Science and engineering				
Agricultural sciences	Agricultural sciences	76.7	Agricultural sciences	62.7
	Biological sciences	12.4	Biological sciences	19.0
	Education	4.6	Engineering	3.8
Biological sciences	Biological sciences	54.6	Biological sciences	68.5
	Chemistry	16.7	Chemistry	8.5
	Agricultural sciences	11.7	Health sciences	5.8
Earth, atmospheric, and ocean sciences	Earth, atmospheric, and ocean sciences	75.7	Earth, atmospheric, and ocean sciences	56.2
	Physics and astronomy	5.4	Physics and astronomy	11.4
	Engineering	3.7	Biological sciences	8.7
Mathematics and computer sciences	Mathematics and computer sciences	71.6	Mathematics and computer sciences	72.9
	Engineering	10.4	Engineering	14.0
	Physics and astronomy	7.7	Physics and astronomy	3.5
Mathematics	Not distinguishable from computer sciences	na	Mathematics	81.1
			Engineering	6.1
			Physics and astronomy	3.5
Computer sciences	Not distinguishable from mathematics	na	Computer sciences	45.5
			Engineering	23.7
			Mathematics	14.5
Physical sciences				
Chemistry	Chemistry	86.5	Chemistry	83.8
	Engineering	4.6	Biological sciences	4.6
	Health sciences	2.9	Engineering	4.6
Physics and astronomy	Physics and astronomy	76.4	Physics and astronomy	81.6
	Engineering	13.0	Engineering	10.6
	Mathematics and computer sciences	4.6	Mathematics and computer sciences	3.6
Psychology	Psychology	65.8	Psychology	70.0
	Humanities	12.7	Humanities	8.5
	Social sciences	6.3	Social sciences	5.2
Social sciences	Social sciences	57.7	Social sciences	58.8
	Humanities	16.6	Humanities	15.8
	Professional fields/other	9.2	Professional fields/other	8.1
Engineering	Engineering	89.3	Engineering	86.3
	Physics and astronomy	3.7	Physics and astronomy	5.5
	Chemistry	2.5	Mathematics and computer sciences	2.9
Non-science and engineering				
Education	Education	44.1	Education	41.1
	Humanities	24.6	Humanities	17.4
	Social sciences	8.9	Professional fields/other	9.4
Health sciences	Health sciences	52.9	Health sciences	54.4
	Biological sciences	14.5	Biological sciences	14.9
	Chemistry	10.9	Psychology	5.2
Humanities	Humanities	84.7	Humanities	80.4
	Education	4.5	Social sciences	6.2
	Social sciences	4.2	Education	4.3
Professional fields/other	Professional fields/other	51.2	Professional fields/other	41.3
	Social sciences	15.9	Humanities	15.5
	Humanities	14.4	Social sciences	13.8

na = not applicable.

NOTE: Percentages are based on number of Ph.D.s in doctoral field.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

examined (57 percent in 1980–81, 58 percent in 1996–97, 61 percent in 1998–99). Another third or more of doctorate recipients in 1980–81 (38 percent), 1996–97 (36 percent), and 1998–99 (32 percent) relied on personal resources—loans, support from family members, and their own earnings and savings—as the primary source of support for their graduate education, but with variation by field. Personal resources were the principal mode of support for more about half (53 percent) of Ph.D.s in non-S&E fields compared with about one-fifth (20 percent) of those in S&E fields. The remaining percentage of doctorate recipients in each of the cohorts discussed above relied on other sources of support, such as state and foreign support (5 percent in 1980–81, 6 percent in 1996–97, 7 percent in 1998–99).

Activities in Year before Receiving Doctorate

The activities of doctoral students in the year before graduation are consistent with the patterns of support reported for doctoral study, which show heavy reliance on personal resources and such mechanisms as assistantships and fellowships. Full-time employment in the year before the doctorate was received declined substantially after the early 1970s, when 44 percent of Ph.D.s were employed full time, to 35 percent in 1995–99. Part-time employment, in contrast, more than doubled between the 1970–74 and 1995–99 periods, from 5 to 12 percent (table 4-2).

Reliance on assistantships in the year before receiving the doctorate became more common and reliance on fellowships less common between the early 1960s and late 1990s. The shift may reflect the increased proportions of foreign nationals among Ph.D.s. Foreign nationals are not eligible for many of the fellowships available to U.S. citizens.

TABLE 4-2. Activities of Ph.D.s in year before receiving doctorate: 1970–74 and 1995–99

(Percent)

Activity	1970–74	1995–99
Assistantship	24.7	29.8
Fellowship	18.6	13.9
Full-time employed	43.9	34.8
College/university teaching	24.3	11.4
College/university non-teaching	4.5	5.8
Elementary/secondary teaching	2.4	2.0
Elementary/secondary non-teaching	2.8	3.0
Industry/business	3.4	6.4
Other/unknown	6.5	6.2
Part-time employed	5.2	12.5
Not employed	5.2	8.5
Other	2.3	0.4

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Indebtedness

Information on the debt status of Ph.D.s at graduation has been collected since the late 1980s. In 1999, for the first time, about half of graduating Ph.D.s reported having debt stemming from their undergraduate and graduate educations. The proportion of non-S&E Ph.D.s reporting indebtedness increased from 44 percent in the late 1980s to 52 percent in 1999. Among S&E Ph.D.s, the proportion reporting debt fluctuated, but the percentage was about the same (49 percent) in 1999 as it had been 10 years earlier.

Not only did more Ph.D.s have debt at the close of the century, they also had larger amounts of debt (table 4-3). Although there were increases during the 1990s in the proportion in all debt-level categories above $10,000, the greatest increase was in the category for debt above $30,000, which rose from 2 to 12 percent. About one-fifth of all Ph.D.s in 1998–99 owed more than $20,000, whereas about 7 percent owed that amount in 1988–89.

The pattern of rising debt was most notable in non-S&E fields. The percentage of non-S&E Ph.D.s with education-related debt above $20,000 more than quadrupled between 1988–89 and 1998–99, from about 5 to 22 percent. During the same time interval, the percentage of S&E Ph.D.s with debt above $20,000 more than doubled, from 7 to 18 percent.

Time to Doctorate

Financial support through government programs and academic institutions, reliance on personal resources and loans, the extent of family responsibilities and dependents, and employment options during graduate study or between degrees all can influence the time it takes to attain the doctorate. Some of these factors are matters of personal choice or necessity. Others are related to characteristics of doctoral programs in specific fields and in particular institutions or to eligibility requirements for certain types of financial support funded by the federal government. Whether or not a master's degree is required can also affect the pace of graduate study. In addition, external events, such as wars, can postpone or interrupt a person's education, thereby increasing the time it takes to earn the doctorate.

TABLE 4-3. Education-related debt of doctorate recipients: 1988–89 and 1998–99

(Percent)

	All fields		Science and engineering		Non-science and engineering	
Debt level	1988–89	1998–99	1988–89	1998–99	1988–89	1998–99
No debt	52.9	50.4	51.2	51.6	55.7	48.2
Total with debt	47.1	49.6	48.8	48.4	44.3	51.8
$5,000 or less	16.5	9.8	16.6	10.1	16.3	9.3
$5,001–$10,000	12.5	8.1	13.0	8.2	11.6	8.0
$10,001–$20,000	11.2	11.8	11.6	11.7	10.6	12.0
$20,001–$30,000	4.6	7.5	4.9	6.9	4.0	8.5
$30,001 or more	2.0	12.4	2.3	11.5	1.4	14.0
Debt level unknown	0.3	0.0	0.3	0.0	0.3	0.0

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Over the course of the 20th century, there was a gradual increase in the time it took students to earn their doctorates. This upward trend is evident in all three ways that time can be measured from available data: (1) total time to doctorate (TTD), the total elapsed calendar time between receipt of the baccalaureate and receipt of the doctorate, including time not enrolled in school; (2) registered time to doctorate (RTD), the time in attendance at all colleges and universities between receipt of the baccalaureate and receipt of the doctorate, including enrollment not related to the doctoral program; and (3) postbaccalaureate time to doctorate (PTD), total elasped calendar years between the first postbaccalaureate attendance at the institution that awarded the doctorate and receipt of the doctorate.[3] PTD includes time spent in a master's degree program if these studies were at the same institution that granted the doctorate.

Field of Doctorate

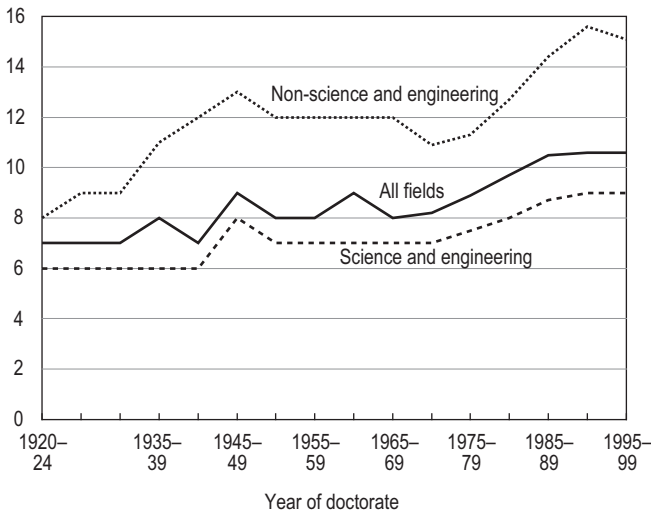
Between 1920–24 and 1995–99 the median overall TTD rose from 7 years to 11 years (figure 4-14). The computation of RTD requires additional data elements collected only in the Survey of Earned Doctorates, so RTD is available only for the last four decades of the century. Between the periods 1960–64 and 1995–99, the median overall RTD grew from 5 years to 7 years (figure 4-15). The fact that TTD rose more sharply than RTD in recent decades means that Ph.D.s were spending more time out of school before completing their doctorates. Both TTD and RTD were substantially shorter for S&E Ph.D.s than for non-S&E Ph.D.s. The increases for both measures were greater in non-S&E than in S&E fields.

The third measure, PTD, can be computed only for doctorate recipients who graduated in 1993–99. Although data from this measure cover just 7 years, it appears that the time spent in graduate work at the doctorate-granting institution (median PTD of 6 years), is changing little despite changes in the other measures. Moreover, the results for 1993–99 show little difference in PTD among the major fields.

For the 1995–99 cohort, the median PTD was the same (6 years) for S&E fields and non-S&E fields in the aggregate (table 4-4). There was some variation by subfield, but only humanities Ph.D.s, at a median of 7 years, exceeded the overall median PTD.

There was greater variation by field in TTD and RTD. Historically, chemistry Ph.D.s have had the shortest times to completion of the doctorate. In 1995–99, their median TTD was 7 years and their median RTD was 6 years. Master's degrees were least common among chemistry Ph.D.s, so their shorter times to completion may be partly explained by a greater tendency to move directly into a

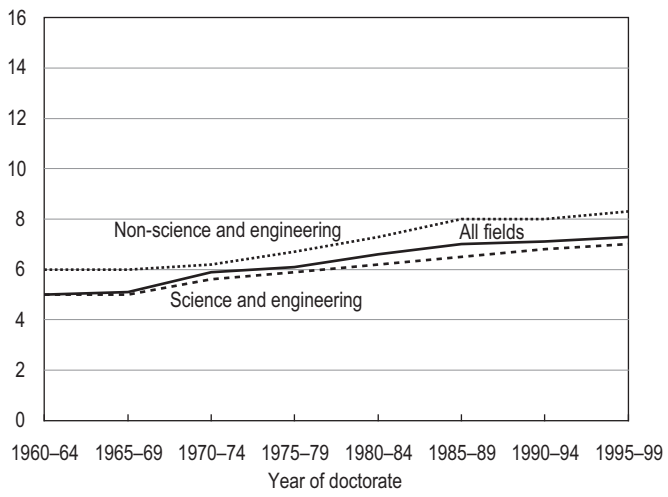
FIGURE 4-14. Total time to doctorate, by broad field of study: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

[3] Before 1969, the calculation of RTD and TTD was based on whole years; from 1969 on it was based on months and years. The calculation of PTD is based on whole years.

FIGURE 4-15. Registered time to doctorate, by broad field of study: 1960–99



NOTE: Before 1969 registered time to doctorate (RTD) was based on whole years to degree; from 1969 on, RTD was based on years and months to degree.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 4-4. Total time to doctorate, registered time to doctorate, and time from first postbaccalaureate attendance at Ph.D.-granting institution to doctorate, by major field: 1995–99

(Median years)

Field	TTD	RTD	PTD
All fields	10.6	7.3	6.0
Science and engineering	9.0	7.0	6.0
Agricultural sciences	11.1	6.8	5.0
Biological sciences	8.4	6.9	6.0
Earth, atmospheric, and ocean sciences	10.8	7.6	6.0
Mathematics and computer sciences	9.0	7.0	6.0
Mathematics	8.3	6.9	5.0
Computer sciences	10.0	7.4	6.0
Physical sciences	7.4	6.4	6.0
Chemistry	7.0	6.0	5.0
Physics and astronomy	7.8	6.9	6.0
Psychology	9.3	7.2	6.0
Social sciences	11.0	8.0	6.0
Engineering	9.0	6.5	5.0
Non-science and engineering	15.1	8.3	6.0
Education	20.0	8.3	6.0
Health sciences	14.2	7.8	6.0
Humanities	11.8	8.6	7.0
Professional fields/other	13.6	7.8	6.0

NOTES: TTD is total time to doctorate, based on years and months to degree. RTD is registered time to doctorate, based on years and months to degree. PTD is postbaccalaureate time to doctorate, based on whole years from year of graduate-school entry.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

doctoral program soon after receiving the baccalaureate. In contrast, the field of education typically requires students to have several years of work experience in elementary or secondary schools before receiving the doctorate, with the result that the time between baccalaureate and doctorate is relatively long compared with other fields. Doctorate recipients in education have taken the most elapsed time to complete their degrees: a median TTD of 20 years in 1995–99.

Demographic Groups

Many factors, including domestic and international conditions, influence the time it takes graduate students to earn the doctorate. Furthermore, fields differ in terms of the availability of financial support for full-time graduate study, and members of the various demographic groups tend to favor some fields over others. The interactions of all these elements are ultimately reflected in measures of the elapsed time it takes to complete the doctorate.

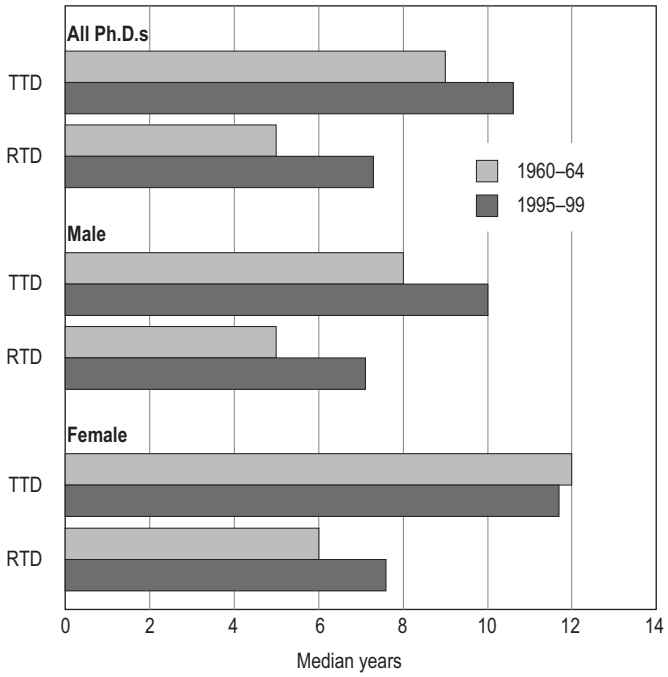
Generally, time-to-doctorate, as measured by both TTD and RTD, has been considerably shorter for men than for women, shorter for temporary residents than for permanent residents and U.S. citizens, and among U.S. citizens, shorter for Asians/Pacific Islanders than for other racial/ethnic groups.

The gaps between women and men in TTD and RTD have narrowed over the years (figure 4-16). Men's TTD and RTD increased 2 years between the periods 1960–64 and 1995–99, to 10 years for TTD and to 7 years for RTD, whereas women's TTD remained about the same and their RTD increased from 6 to 8 years. The differences in time-to-doctorate for men and women correspond to the differences in the median times for S&E and non-S&E fields. Compared with men, women were more concentrated in non-S&E fields than in S&E fields. Consequently, women's time-to-doctorate measures are more similar than men's to the pattern for non-S&E fields.

TTD and RTD increased for each citizenship group between 1960–64 and 1995–99, with the increases largest for permanent residents (figure 4-17). Temporary residents, with their heavy concentration in S&E fields, took less time in 1995–99 to complete their doctorates than permanent residents and U.S. citizens did. An analysis of time-to-degree for various demographic groups, which incorporated information for students who did not complete degrees, showed that foreign Ph.D. students have higher completion rates as well as lower average times to degree completion (Espenshade and Rodriguez 1997).

Reliable race/ethnicity data first became available in 1975. Since then, among U.S. citizens the median RTD has increased for every racial/ethnic group, and the median TTD has increased for every group but Asians/

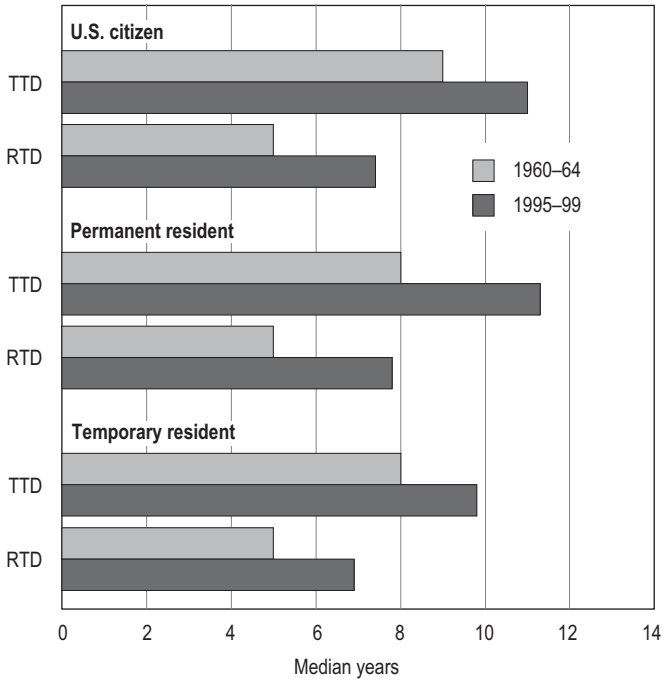
FIGURE 4-16. Total time to doctorate and registered time to doctorate, by sex: 1960–64 and 1995–99



NOTES: Before 1969 registered time to doctorate (RTD) was based on whole years to degree; from 1969 on, RTD was based on years and months to degree. TTD is total time to doctorate.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 4-17. Total time to doctorate and registered time to doctorate, by citizenship status: 1960–64 and 1995–99

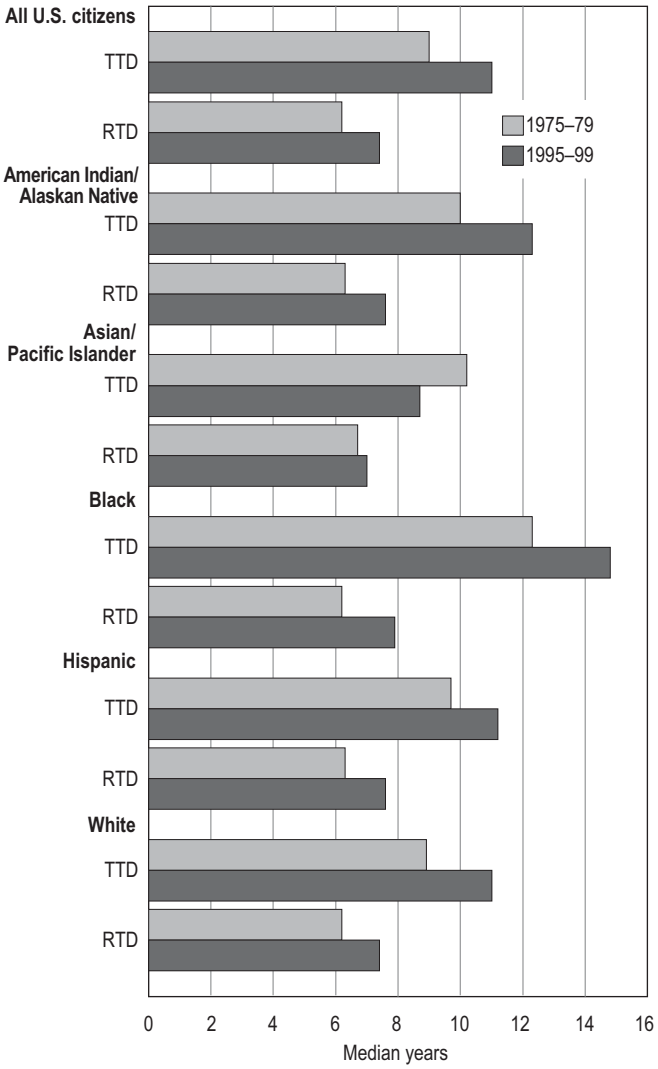


NOTES: Before 1969 registered time to doctorate (RTD) was based on whole years to degree; from 1969 on, RTD was based on years and months to degree. TTD is total time to doctorate.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Pacific Islanders (figure 4-18). Among racial/ethnic groups in 1995–99, Asians/Pacific Islanders—highly concentrated in S&E fields—had the shortest median TTD (9 years) and the shortest median RTD (7 years). Blacks, with their heavy concentration in the field of education, had the longest times to degree completion.

FIGURE 4-18. U.S. citizens' total time to doctorate and registered time to doctorate, by race/ethnicity: 1975–79 and 1995–99



NOTE: RTD is registered time to doctorate; TTD is total time to doctorate.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

REFERENCES

Espenshade, T.J., and G. Rodriguez. 1997. Completing the Ph.D.: Comparative performances of U.S. and foreign students. *University of Texas/Social Science Quarterly* 72(2):593–605.

National Academy of Sciences, National Research Council (NAS/NRC). 1968–98. *Summary Report 1967…1996: Doctorate Recipients from United States Universities*. Annual series of survey results from the Survey of Earned Doctorates, conducted by

NAS–NRC under sponsorship of the National Science Foundation, National Institutes of Health, National Endowment for the Humanities, U.S. Department of Education, and U.S. Department of Agriculture. Washington, DC.

National Opinion Research Center (NORC). 1998–2002. *Doctorate Recipients from United States Universities: Summary Report 1997…2001*. Annual series of survey results from the Survey of Earned Doctorates, conducted by NORC for the National Science Foundation, National Institutes of Health, National Endowment for the Humanities, U.S. Department of Education, U.S. Department of Agriculture, and National Aeronautics and Space Administration. Chicago.

National Science Foundation (NSF). 2000. *Modes of Financial Support in the Graduate Education of Science and Engineering Doctorate Recipients*. NSF 00-319. Arlington, VA.

U.S. Department of Education, National Center for Education Statistics (USED/NCES). 2002. *Digest of Education Statistics, 2001*, table 182. Washington, DC.

CHAPTER 5. BACCALAUREATE AND DOCTORAL INSTITUTIONS

Highlights

U.S. BACCALAUREATE INSTITUTIONS

- **Leading Baccalaureate Institutions.** Fifty institutions, mostly those with large enrollments, accounted for more than one-third of the baccalaureate degrees earned by individuals who later earned doctorates. Oberlin College was the only small, nondoctorate-granting institution ranked in the top 50 baccalaureate institutions of Ph.D.s who graduated between 1920 and 1999.
- **Top Institutions of Men and Women.** The lists of top 50 institutions of men and women who received doctorates between 1920 and 1999 had 34 institutions in common.
- **Research-Intensive Universities.** Research-intensive institutions were less prominent in women's than in men's undergraduate educations; among racial and ethnic groups, research-intensive universities figured prominently in the undergraduate educations of Asians/Pacific Islanders.
- **Top Institutions of U.S. Citizen American Indians/Alaskan Natives.** Many of the top baccalaureate institutions of U.S. American Indian/Alaskan Native Ph.D.s were in the southwestern, southeastern, and midwestern regions of the United States.
- **Top Institutions of U.S. Citizen Asians/Pacific Islanders.** Among U.S. Asians/Pacific Islanders who earned doctorates between 1975 and 1999, 62 percent received baccalaureates from the top 50 institutions for this demographic group.
- **Top Institutions of U.S. Citizen Blacks.** More than 42 percent of all U.S. blacks who received doctorates between 1975 and 1999 earned bachelor's degrees at historically black colleges and universities (HBCUs).
- **Top Institutions of U.S. Citizen Hispanics.** Forty-three of the top 50 institutions of U.S. Hispanics who earned doctorates between 1975 and 1999 were in states or territories with large Hispanic populations—Arizona, California, Florida, New Mexico, New York, Puerto Rico, and Texas.

U.S. DOCTORAL INSTITUTIONS

- **Regions and States.** Doctoral education was transformed during the 20th century from a regional to a national activity. In the early 1920s, only 26 states awarded doctorates; by the mid-1960s, institutions in all 50 states, the District of Columbia, and Puerto Rico awarded doctorates.
- **Year of First Conferred Doctorate.** The 50 institutions that were awarding doctorates at the beginning of the 20th century remained prominent through the end of the century, awarding 40 percent of all doctorates in 1995–99.
- **Leading Doctoral Institutions.** Ph.D.s were more highly concentrated in their top doctoral institutions than in their top baccalaureate institutions. Although 426 institutions awarded doctorates between 1920 and 1999, the top 50 of these awarded more than three-fifths of the doctorates earned.

  Only 15 of the top 50 institutions of Ph.D.s who graduated in 1995–99 were privately controlled, compared with 29 in the early 1920s.
- **Top Institutions of U.S. Citizen American Indians/Alaskan Natives.** U.S. American Indians/Alaskan Natives received doctorates from 274 institutions in the 1975–99 period. Their top 50 institutions were dispersed across 30 states.
- **Top Institutions of U.S. Citizen Asians/Pacific Islanders.** About 65 percent of U.S. Asians/Pacific Islanders received doctorates from this demographic group's top 50 institutions between 1975 and 1999, and nearly 18 percent received doctorates from the top 5 institutions.
- **Top Institutions of U.S. Citizen Blacks.** Three of the top 50 doctoral institutions of U.S. blacks were HBCUs—Howard University, Clark Atlanta University, and Texas Southern University.
- **Top Institutions of U.S. Citizen Hispanics.** Between 1975 and 1999, more than three in five U.S. Hispanic Ph.D.s earned doctorates at their top 50 institutions.

Introduction

The path to the doctorate begins with undergraduate institutions. Almost all doctorate recipients earn a bachelor's degree before the doctorate. Their baccalaureate institutions range from large doctorate-granting universities to small liberal arts colleges. By tracing the flow of students from baccalaureate to doctorate, one can see both breadth and concentration in U.S. higher education. Breadth is evident in the wide range of baccalaureate institutions of Ph.D.s and in the presence of doctorate-granting institutions in all 50 states, the District of Columbia, and Puerto Rico. Concentration is evident in the large proportion of Ph.D.s with baccalaureates and doctorates from a relatively small set of institutions. The information about student flows documents the expansion of doctoral education to all demographic groups.

This chapter continues the discussion of the path to the doctorate begun in chapter 4. U.S. institutions where Ph.D.s received their bachelor's and doctoral degrees are examined in the context of doctoral fields and demographic characteristics of Ph.D.s. More than 1,600 U.S. institutions awarded baccalaureates to the Ph.D.s of the 20th century, and 426 institutions granted their doctorates. The leading colleges and universities, in terms of the number of Ph.D.s who received baccalaureates or doctorates from these institutions, are presented within this chapter and in appendix tables.[1]

U.S. Baccalaureate Institutions

About 1.1 million of the 1.35 million individuals who received doctorates between 1920 and 1999 earned baccalaureates in the United States.[2] More than 1,600 U.S. institutions are represented among the baccalaureate institutions of these Ph.D.s. The majority of Ph.D.s who graduated in the 1920s, 1930s, and 1940s earned baccalaureates at private colleges and universities, but the share of degrees earned at private institutions generally declined throughout the century (figure 5-1). Beginning in the 1950s, public institutions accounted for the majority of bachelor's degrees awarded to doctorate recipients.

Leading Baccalaureate Institutions

Ph.D.s completed their bachelor's degrees in a relatively small number of institutions. Of the more than 1,600 U.S. institutions that awarded bachelor's degrees to individuals who earned doctorates between 1920 and 1999, the top 50 (based on the number of Ph.D.s who received baccalaureates from these institutions) accounted for more than 33 percent of these degrees (figure 5-2). Thirty-two of the top 50 institutions were publicly controlled and 18 were privately controlled.[3] Oberlin College was the single small, nondoctorate-granting institution ranked in the top 50 baccalaureate institutions of Ph.D.s.

Large institutions have dominated the baccalaureate institutions of Ph.D.s because of the sheer volume of their student enrollments and graduates. When, however, institutional size is controlled for by enrollments or total output of baccalaureates to arrive at a measure of doctoral productivity, several liberal arts colleges rank with research-intensive universities (those classified as Research I and Research II institutions by the Carnegie Foundation for the Advancement of Teaching; see table 5-11) as leading baccalaureate institutions. In terms of the proportion of its baccalaureate recipients who eventually earn a doctorate, Harvey Mudd College is one of the most productive small institutions. Harvey Mudd has an annual enrollment of fewer than 700 students, yet it awarded baccalaureates to 757 individuals who received doctorates between 1920 and 1999.

Ph.D.s who graduated in 1920–24 were much more concentrated in their leading baccalaureate institutions than were Ph.D.s who graduated in 1995–99 (table 5-1, appendix table B-1). During the eight decades between 1920 and 1999, many universities, particularly in the public sector, experienced major growth in student enrollments and degree programs. As a result, some institutions ranked much higher as baccalaureate institutions among recent Ph.D.s than among all Ph.D.s in

[1] Tables in the text compare the top 5 institutions of Ph.D.s across all years with the top 5 institutions of Ph.D.s who graduated in 1995–99. The discussion covers the top 50 institutions; those lists are included in appendix B for reference. Tables listing all institutions can be found with the detailed supplemental tables for this report on the NSF website at http://www.nsf.gov/statistics/nsf06319/.

[2] The discussion in this section is limited to institutions located in the United States. Foreign nationals who earned baccalaureates at U.S. institutions are included. All Ph.D.s (foreign citizens and U.S. citizens) who received baccalaureates from foreign institutions are excluded. For the top 26 baccalaureate institutions of foreign citizens, see table 33 at http://www.norc.uchicago.edu/issues/sed-2003.pdf (accessed 11 April 2005).

[3] Cornell University is listed in this report as a private school, as it is by the National Center for Education Statistics, U.S. Department of Education. The report includes doctorates from both the private and public sides of Cornell.

the full period from 1920 to 1999. The University of Texas-Austin, for example, placed higher on the list for Ph.D.s graduating in 1995–99 than on the 1920–99 list, and Harvard University ranked lower in 1995–99 than in the full period.

Top Institutions of S&E and Non-S&E Ph.D.s

The top 50 baccalaureate institutions of S&E Ph.D.s in the period 1920 to 1999 accounted for about 39 percent of bachelor's degrees awarded to this group (appendix table B-2). The corresponding percentage for the 1995–99 Ph.D. cohort was slightly less, at 37 percent.

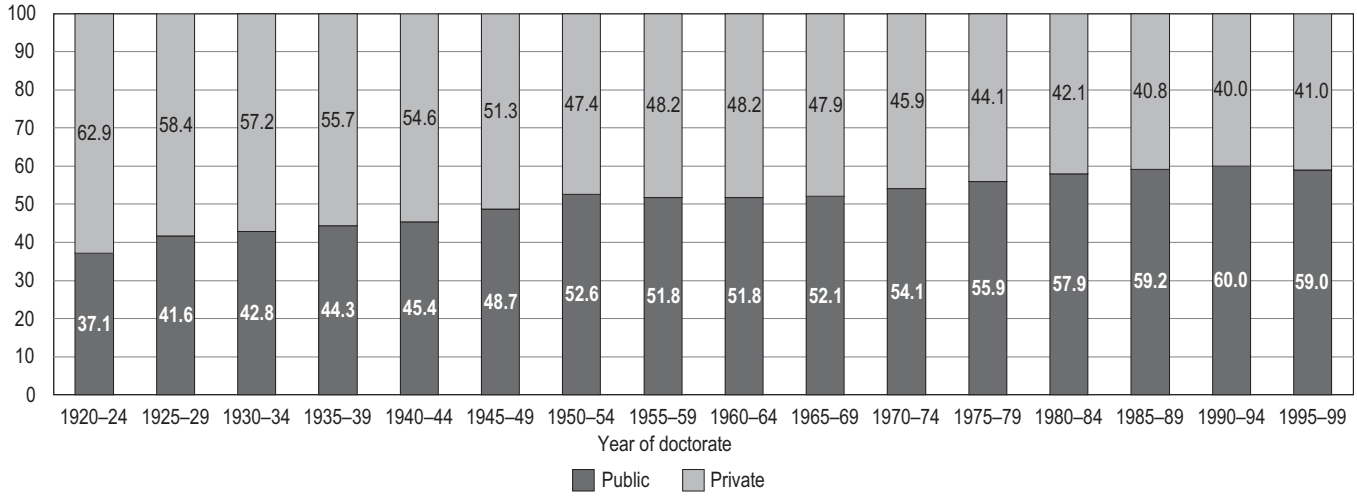
Non-S&E Ph.D.s were less highly concentrated than S&E Ph.D.s in their top 50 baccalaureate institutions (appendix table B-3). Overall about 28 percent of non-S&E Ph.D.s graduating between 1920 and 1999 had received bachelor's degrees from those 50 institutions.

Oberlin College was the only small, nondoctorate-granting college to place among the top 50 baccalaureate institutions of both S&E and non-S&E Ph.D.s. It ranked 32nd among non-S&E Ph.D.s and 44th among S&E Ph.D.s between 1920 and 1999. Placing lower but in the top 100 were Wellesley, Barnard, and Wheaton (Illinois) among non-S&E Ph.D.s, and Swarthmore, Carleton, and Reed among S&E Ph.D.s.

Top Institutions of Men and Women

Research-intensive institutions figured prominently among the top 50 baccalaureate institutions of both men

FIGURE 5-1. Baccalaureate institutions of Ph.D.s, distributed by control of institution: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

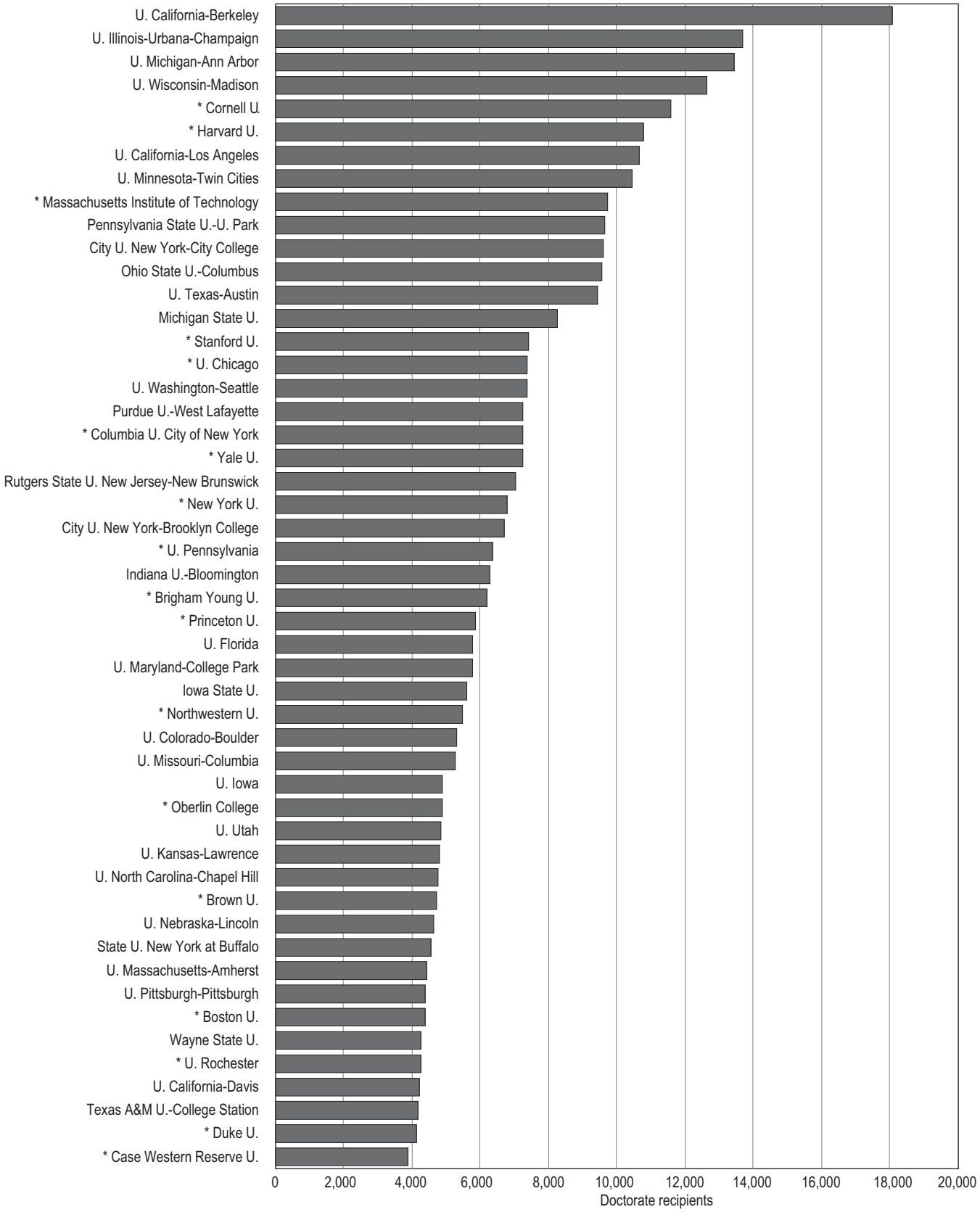
TABLE 5-1. Top 10 baccalaureate institutions of Ph.D.s: 1920–99, 1920–24, and 1995–99

1920–99		1920–24		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	1,068,144	All U.S. institutions	3,801	All U.S. institutions	140,286
U. California-Berkeley	18,055	U. Chicago*	128	U. California-Berkeley	2,330
U. Illinois	13,704	U. Wisconsin	123	U. Michigan	1,562
U. Michigan	13,440	Cornell U.*	112	Cornell U.*	1,545
U. Wisconsin	12,627	Harvard U.*	107	U. Illinois	1,524
Cornell U.*	11,598	U. Michigan	92	U. Wisconsin	1,390
Harvard U.*	10,772	U. Illinois	91	U. Texas-Austin	1,328
U. California-Los Angeles	10,682	U. California-Berkeley	87	Pennsylvania State U.	1,274
U. Minnesota	10,449	Columbia U.*	77	Harvard U.*	1,209
Massachusetts Institute of Technology*	9,739	Yale U.*	74	U. California-Los Angeles	1,171
Pennsylvania State U.	9,669	Indiana U.	65	U. Minnesota	1,105
Top 5 as percent of total	6.5	Top 5 as percent of total	14.8	Top 5 as percent of total	6.0
Top 10 as percent of total	11.3	Top 10 as percent of total	25.2	Top 10 as percent of total	10.3

* Privately controlled.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-2. Top 50 U.S. baccalaureate institutions of Ph.D.s: 1920–99



* Privately controlled

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

and women who went on for doctorates, but less so for women. Among Ph.D.s graduating between 1920 and 1999, men's top 50 baccalaureate institutions accounted for about 35 percent of their undergraduate degrees, and women's top 50 baccalaureate institutions accounted for 32 percent of their undergraduate degrees (appendix tables B-4, B-5). The top 5 baccalaureate institutions for male and female Ph.D.s had considerable overlap (table 5-2).

The top 50 baccalaureate institutions of male Ph.D.s and of female Ph.D.s between 1920 and 1999 had 34 institutions in common, although they ranked differently on the two lists. Several of the institutions on the top 50 list for women but not on the top 50 list for men enrolled only women during many of the years when future Ph.D.s were receiving their undergraduate education (Kane, Anzovin, and Podell 1997:174).[4] The institutions appearing only on the 1920–99 list of men's top baccalaureate institutions include some technical institutions and some schools that changed to coeducational status in the later decades of the century.

By the end of the 20th century, the lists of the 50 top baccalaureate institutions for male and for female Ph.D.s were converging, with 40 institutions appearing on both lists in 1995–99 (compare appendix tables B-4, B-5).

Top Institutions of Racial and Ethnic Groups

The collection of data on race/ethnicity did not begin until 1975, but data since then have shown that the characteristics of baccalaureate institutions differ among U.S. citizen racial/ethnic groups (tables 5-3 through 5-7). Research-intensive institutions played a less prominent role in the undergraduate education of blacks, Hispanics, and American Indians/Alaskan Natives than in the undergraduate education of whites and Asians/Pacific Islanders. Location, on the other hand, seems to have played a significant role for underrepresented minorities.

American Indians/Alaskan Natives

The baccalaureate institutions of American Indian/Alaskan Native Ph.D.s reflect the geographic distributions of these populations, especially the American Indian population, in the United States (appendix table B-6). Institutions located in the southwestern, southeastern, and midwestern regions of the United States figured prominently among the top 50 baccalaureate institutions of this group. The top 5 institutions awarded nearly one-tenth of the baccalaureates received by American Indian/Alaskan Native Ph.D.s in both 1975–99 and 1995–99 (table 5-3).

Asians/Pacific Islanders

Large, research-intensive universities ranked high among the baccalaureate institutions of Asian/Pacific Islander Ph.D.s. The population centers of Asians/Pacific Islanders are reflected in their top baccalaureate institutions; 15 of the top 50 institutions on the 1975–99 list were in California, as were 2 of the top 5 institutions (table 5-4, appendix table B-7). The composition of the leading baccalaureate institutions of Asians/Pacific Islanders also reflects the group's greater concentration in S&E fields, as shown by the prevalence of technical institutions, such as Massachusetts Institute of Technology and California Institute of Technology, among their top institutions. Small, nondoctorate-granting colleges, such as Pomona College, San Jose State University, and Wellesley College, were also prominent among the baccalaureate institutions of Asians/Pacific Islanders.

[4] Mount Holyoke College, for example, was the first women's college in the United States, opening in 1837 as Mount Holyoke Female Seminary. Mount Holyoke ranked 26th among the baccalaureate institutions of women who received doctorates between 1920 and 1999.

TABLE 5-2. Top 5 baccalaureate institutions of male and female Ph.D.s: 1920–99 and 1995–99

Male Ph.D.s				Female Ph.D.s			
1920–99		1995–99		1920–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	757,823	All U.S. institutions	75,103	All U.S. institutions	310,193	All U.S. institutions	65,106
U. California-Berkeley	13,458	U. California-Berkeley	1,387	U. California-Berkeley	4,593	U. California-Berkeley	940
U. Illinois	10,720	U. Illinois	945	U. Michigan	4,052	U. Michigan	714
Harvard U.*	9,642	Cornell U.*	908	U. California-Los Angeles	3,238	Cornell U.*	636
U. Wisconsin	9,448	U. Michigan	848	U. Wisconsin	3,179	U. California-Los Angeles	591
U. Michigan	9,388	U. Wisconsin	815	Cornell U.*	3,155	U. Texas-Austin	588
Top 5 as percent of total	6.9	Top 5 as percent of total	6.5	Top 5 as percent of total	5.9	Top 5 as percent of total	5.3

* Privately controlled.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-3. Top 5 baccalaureate institutions of American Indian/Alaskan Native, U.S. citizen Ph.D.s: 1975–99 and 1995–99

1975–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	2,635	All U.S. institutions	842
Oklahoma State U.	62	U. Oklahoma	20
U. Oklahoma	58	U. California-Berkeley	18
Northeastern State U.	50	Northeastern State U.	17
U. California-Berkeley	40	Oklahoma State U.	17
U. North Carolina-Pembroke	33	Auburn U.	10
Top 5 as percentage of total	9.2	Top 5 as percentage of total	9.7

NOTE: Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-4. Top 5 baccalaureate institutions of Asian/Pacific Islander, U.S. citizen Ph.D.s: 1975–99 and 1995–99

1975–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	12,475	All U.S. institutions	4,657
U. California-Berkeley	1,126	U. California-Berkeley	448
U. Hawaii-Manoa	611	Massachusetts Institute of Technology*	151
U. California-Los Angeles	524	Harvard U.*	146
Massachusetts Institute of Technology*	387	U. California-Los Angeles	146
Harvard U.*	290	Cornell U.*	111
Top 5 as percent of total	23.6	Top 5 as percent of total	21.5

* Privately controlled.

NOTE: Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Asians/Pacific Islanders were more heavily concentrated in their leading baccalaureate institutions than whites were in theirs. For the entire 1975–99 period, the concentration of Asians/Pacific Islanders in their top 50 baccalaureate institutions was 62 percent (double that of whites).

Blacks

Historically black colleges and universities (HBCUs), most of them in southern states, have been among the leading baccalaureate institutions of black Ph.D.s. These schools constituted the top 5 baccalaureate institutions of black Ph.D.s in both 1975–99 and 1995–99 (table 5-5). The 105 accredited HBCUs, ranging from 2-year colleges to doctorate-granting universities, were established during the period of reconstruction following the American Civil War and subsequent periods of racial segregation through 1963 for the express purpose of educating blacks (White House Initiative on Historically Black Colleges and Universities 2002; USED/NCES 1985, 1996; NSF 1975–2000, 1990).

HBCUs occupied 33 of the top 50 positions on the list of baccalaureate institutions of U.S. black Ph.D.s who graduated between 1975 and 1999 (appendix table B-8). Howard University, an HBCU, occupied the first position, by a wide margin, for both the periods 1975–99 and 1995–99. Howard was the first university established for blacks under legal segregation to have undergraduate, graduate, and professional schools (Kane, Anzovin, and Podell 1997:174). Forty-one percent of blacks who earned doctorates in the period 1975–99 received their bachelor's degrees from among the 50 top-listed institutions.

In the last quarter of the 20th century, 25,872 blacks earned doctorates. More than 42 percent of those who had a baccalaureate received that degree from an HBCU, although the percentage of black Ph.D.s whose baccalaureate institution was an HBCU was lower in the late 1990s (31 percent) than it was in the late 1970s (56 percent) (figure 5-3). HBCUs also played a significant role in the undergraduate education of black foreign nationals who earned bachelor's degrees in the United States on their way to the doctorate. About one-fifth (21 percent) of foreign black Ph.D.s graduating in the last quarter-century earned their baccalaureates at HBCUs.

Although this chapter focuses on the baccalaureate and doctoral institutions of Ph.D.s, the role of HBCUs at the

TABLE 5-5. Top 5 baccalaureate institutions of black, U.S. citizen Ph.D.s: 1975–99 and 1995–99

1975–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	25,872	All U.S. institutions	6,631
Howard U. * †	752	Howard U. * †	174
Southern U. †	419	Spelman College * †	100
Hampton U. * †	386	Hampton U. * †	82
Florida A&M U. †	382	Florida A&M U. †	78
Tuskegee U. * †	361	Jackson State U. †	71
		Southern U. †	71
Top 5 as percentage of total	8.9	Top 6 as percent of total	8.7

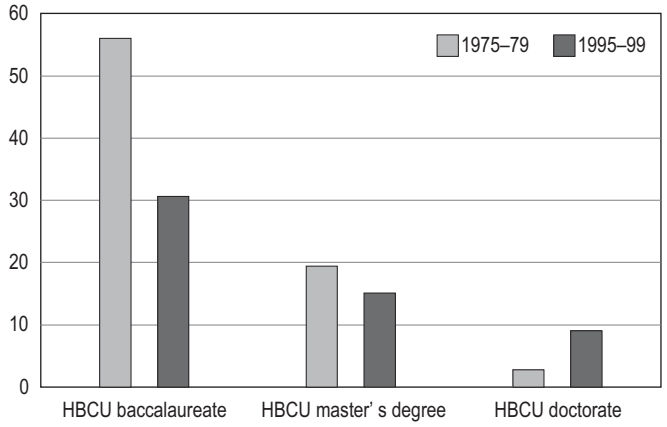
* Privately controlled.

† Historically black college or university.

NOTE: Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-3. Black, U.S. citizen Ph.D.s with baccalaureates, master's degrees, or doctorates awarded by an HBCU: 1975–79 and 1995–99



HBCU = historically black college or university.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

master's degree level is worth noting. For the overall period from 1975 to 1999, more than 17 percent of black Ph.D.s with master's degrees earned those degrees at HBCUs. A downward trend, however, similar to that noted for baccalaureate origins is evident: 15 percent of black Ph.D.s graduating in the 1995–99 period received master's degrees from HBCUs compared with 19 percent of Ph.D.s 20 years earlier, in 1975–79 (figure 5-3).

Hispanics

Location has played a major role in the undergraduate education of Hispanic Ph.D.s. Of the 50 institutions awarding the largest number of bachelor's degrees to Hispanics who earned doctorates between 1975 and 1999, 43 were in states or territories with large Hispanic populations—Arizona, California, Florida, New Mexico, New York, Puerto Rico, and Texas. These institutions accounted for more than half (53 percent) of the bachelor's degrees awarded to Hispanic Ph.D.s who graduated in the periods 1975–99 and 1995–99 (appendix table B-9). The top 5 institutions awarded 20 percent of the baccalaureates received by Hispanic Ph.D.s (table 5-6).

Whites

Most of the leading baccalaureate institutions of white Ph.D.s in the 20th century were large, public, research-intensive universities (table 5-7, appendix table B-10). The top 50 institutions awarded bachelor's degrees to almost one-third (31 percent) of all whites who received doctorates between 1975 and 1999.

U.S. Doctoral Institutions

By a wide majority, most students in the 20th century decided to pursue the doctorate at an institution other than their baccalaureate institution. Of the 1,068,144 Ph.D.s who graduated in 1920–99 and who earned bachelor's degrees in the United States, only 15 percent received their doctorate and their baccalaureate from the same institution. This proportion was even less (12 percent) at the close of the century.

Regions and States

In the early 1920s, institutions in only 26 states and the District of Columbia awarded doctorates, and the institutions were largely concentrated in the northeastern and midwestern regions of the country (figure 5-4). After World War II, doctoral education in the South and West grew substantially, and by the mid-1960s, all 50 states,

TABLE 5-6. Top 5 baccalaureate institutions of Hispanic, U.S. citizen Ph.D.s: 1975–99 and 1995–99

1975–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	15,574	All U.S. institutions	4,745
U. Puerto Rico-Rio Piedras	1,835	U. Puerto Rico-Rio Piedras	478
U. Puerto Rico-Mayaguez	440	U. Puerto Rico-Mayaguez	182
U. Texas-Austin	333	U. Texas-Austin	115
U. California-Berkeley	289	U. California-Berkeley	110
U. California-Los Angeles	252	U. California-Los Angeles	90
Top 5 as percentage of total	20.2	Top 5 as percentage of total	20.5

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

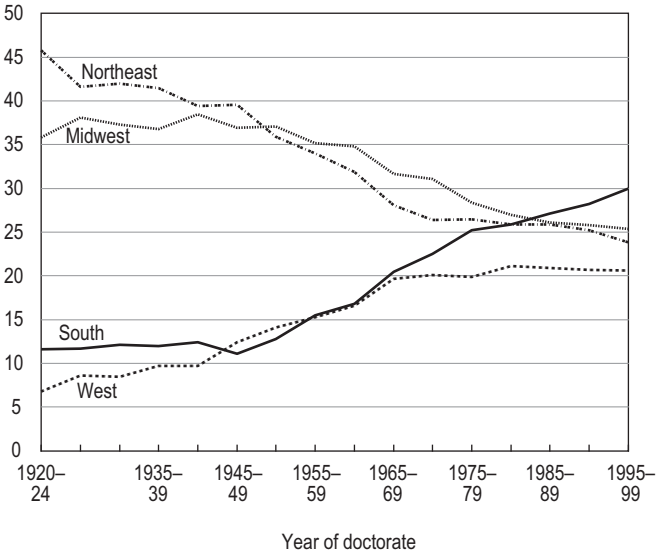
TABLE 5-7. Top 5 baccalaureate institutions of white, U.S. citizen Ph.D.s: 1975–99 and 1995–99

1975–99		1995–99	
Baccalaureate institution	Ph.D.s	Baccalaureate institution	Ph.D.s
All U.S. institutions	550,345	All U.S. institutions	113,543
U. California-Berkeley	7,373	U. California-Berkeley	1,491
U. Michigan	6,469	U. Illinois	1,314
U. Illinois	6,260	U. Michigan	1,285
U. Wisconsin	5,862	Cornell U.*	1,257
Cornell U.*	5,704	U. Wisconsin	1,210
Top 5 as percent of total	5.8	Top 5 as percent of total	5.8

* Privately controlled.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-4. Doctorates awarded, by region of doctoral institution: 1920–99



NOTE: Doctorates were not awarded in Puerto Rico until 1965; in the 1995–99 cohort, awards in Puerto Rico were 0.2 percent of total doctorates awarded.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

the District of Columbia, and Puerto Rico had at least one institution that granted doctorates (figure 5-5).

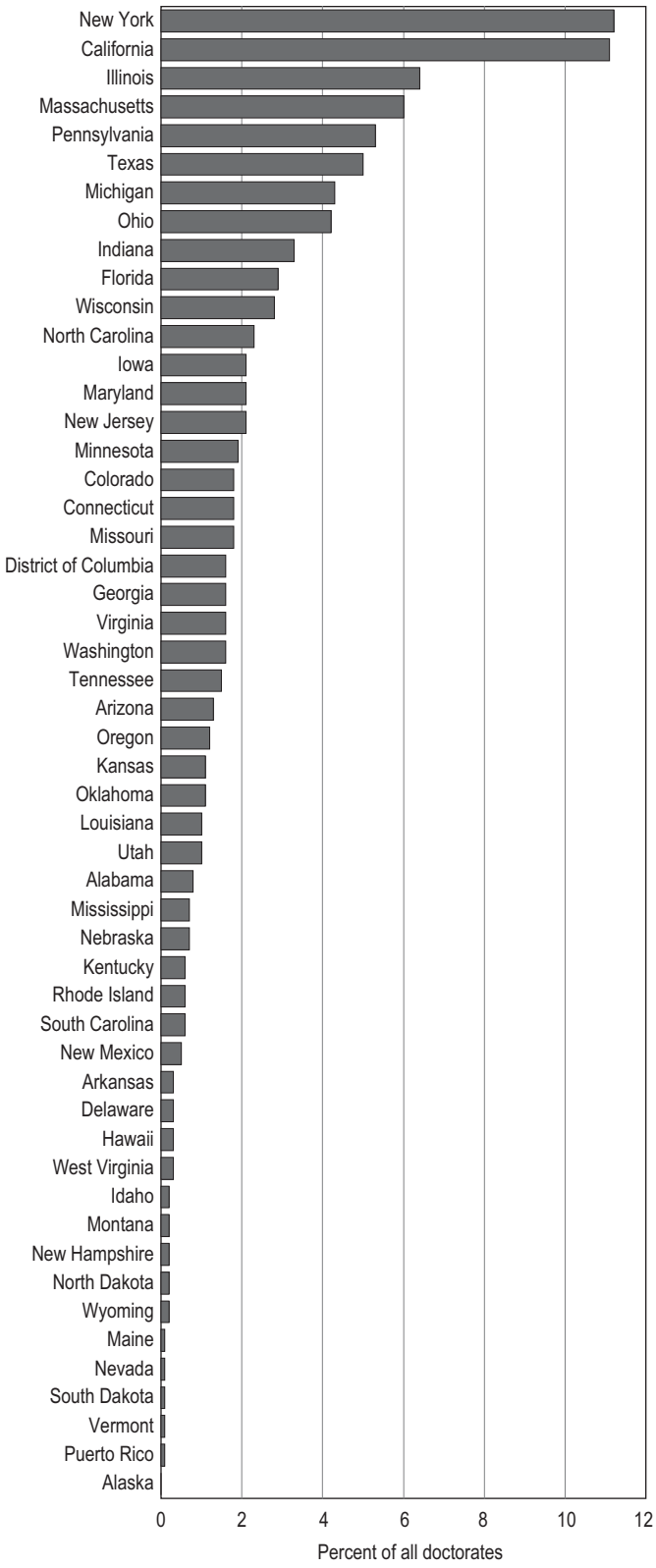
A comparison of the leading doctorate-producing states in 1920–24 and 1995–99 reveals both stability and change. New York and Illinois stayed in the select group of leading states over time, yet the share of doctorates awarded in the top 5 states declined considerably (table 5-8, appendix table B-11). In 1995–99 California ranked first in production of both S&E and non-S&E doctorates (appendix table B-12).

Year of First Conferred Doctorate

The first institutions to confer doctorates have remained prominent in terms of the number of doctorates they awarded in subsequent time periods. The year in which an institution conferred its first doctorate provides one measure of the dynamics of the doctoral enterprise.

Yale University conferred the first three U.S. doctorates in 1861. From that beginning, the number of doctoral institutions grew to 50 during the first two decades of the 20th century (figure 5-6). A total of 426 institutions awarded doctorates between 1861 and 1999. Over the years, a few of these institutions closed, and some merged with other institutions or discontinued their doctoral programs. A few institutions with small doctoral programs did not confer doctorates every year. In the period 1995–99, 401 institutions awarded doctorates; 392 institutions awarded doctorates in 1999. The greatest 5-year period of growth was from 1970 to 1974, when 62 institutions granted doctorates for the first time.

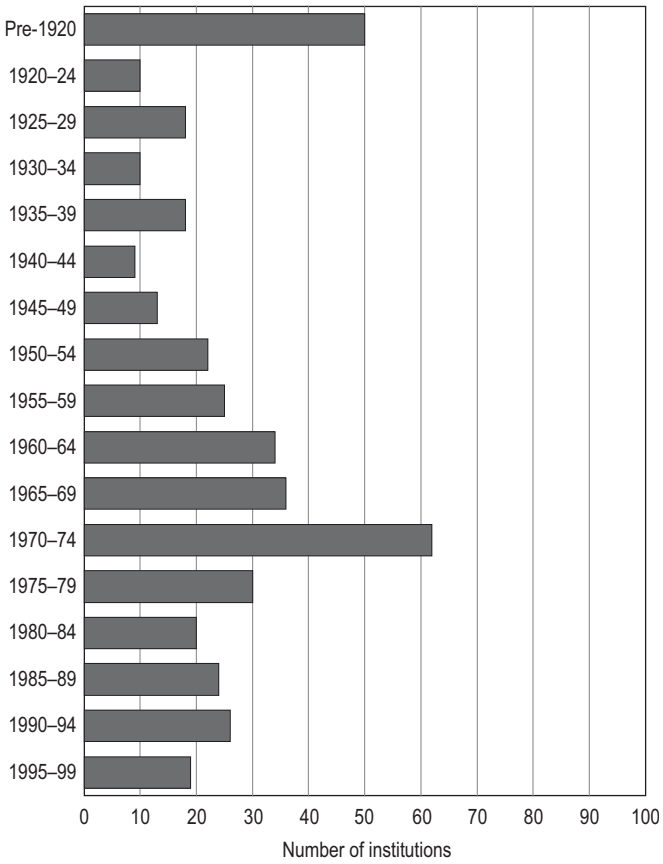
FIGURE 5-5. Doctorates awarded, by location of doctoral institution: 1920–99



NOTES: States that were tied are listed alphabetically. Doctorates awarded in Alaska = <0.1% (369 doctorates).

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-6. Institutions that ever awarded a doctorate, by period of first doctoral award: pre-1920 and 5-year periods from 1920 to 1999



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Because it usually takes many years before new doctoral institutions award a large number of doctorates, the institutions with older, established doctoral programs remained prominent, and newer institutions only gradually increased their share of doctorates. Thus, even as new institutions joined the doctoral pool, the 50 institutions that granted doctorates before 1920 continued to award the majority of doctorates up to the final quarter-century. Their share of doctorates slowly diminished over the course of the century but was still about 40 percent in 1995–99 (figure 5-7). In contrast, the 119 institutions that awarded their first doctorates during the last quarter-century accounted for about 5 percent of all doctorates in 1995–99.

Institutional Control

The first institutions of higher education in Colonial America were privately controlled. Following independence from England, the states began to establish state

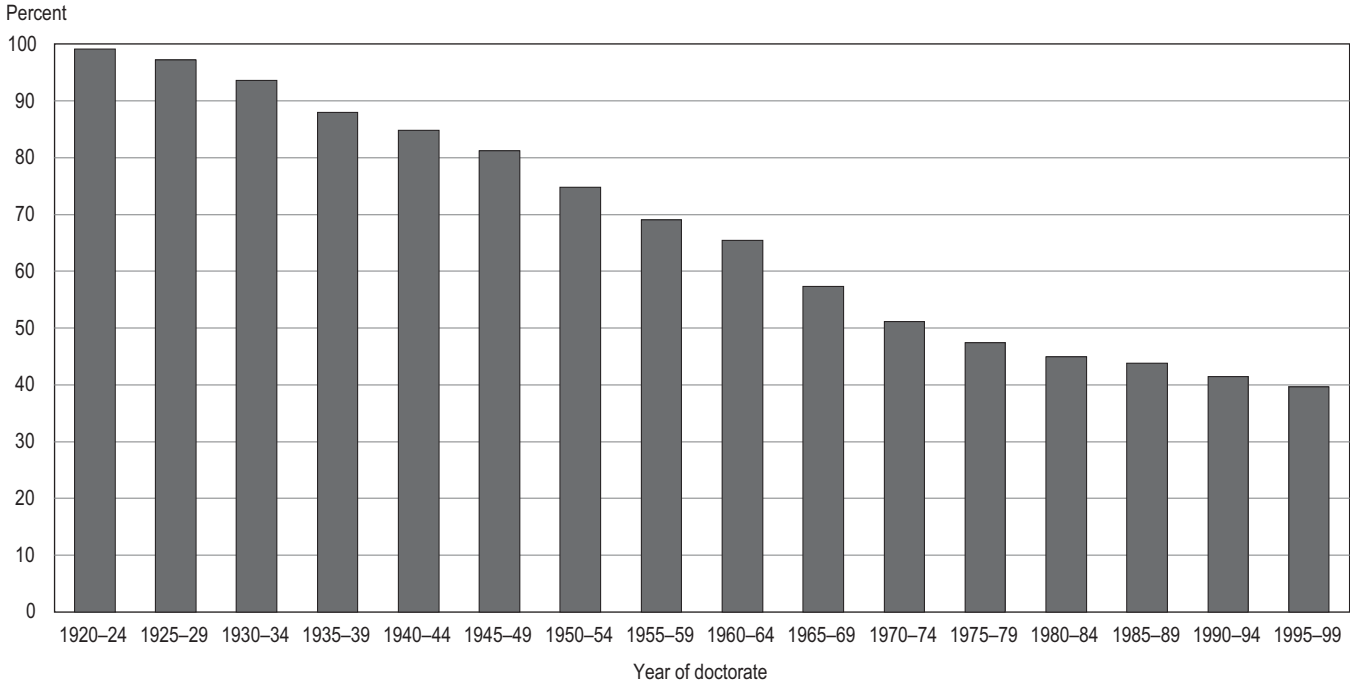
TABLE 5-8. Top 5 state producers of Ph.D.s, by percentage of all Ph.D.s: 1920–99, 1920–24, and 1995–99

1920–99		1920–24		1995–99	
State	Percent	State	Percent	State	Percent
Top 5 states	40.0	Top 5 states	61.9	Top 5 states	37.3
New York	11.2	New York	20.9	California	11.5
California	11.1	Illinois	16.1	New York	8.8
Illinois	6.4	Massachusetts	11.7	Texas	6.4
Massachusetts	6.0	Maryland	6.7	Illinois	5.4
Pennsylvania	5.3	Wisconsin	6.5	Pennsylvania [a]	5.2

[a]1995–99 percentage for Massachusetts also rounds to 5.2%, but exact figure is 5.159% of all Ph.D.s, compared with Pennsylvania's 5.243%.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-7. Doctorates awarded by institutions that began granting doctorates before 1920: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

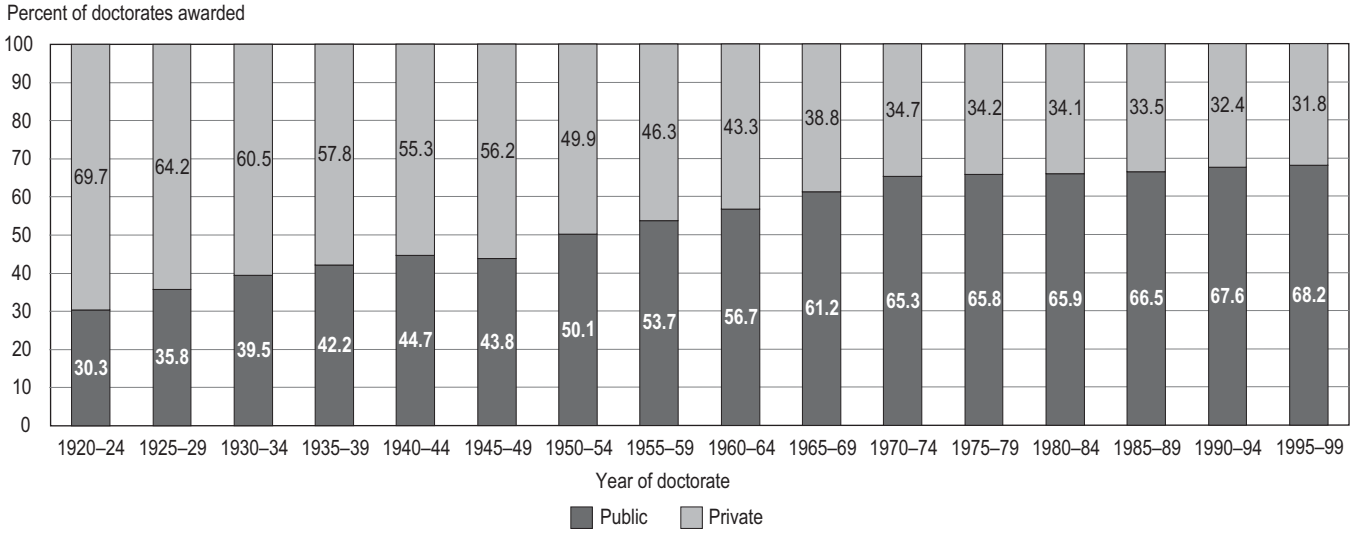
universities, which became the first public institutions of higher education in the United States.

The First and Second Morrill Acts gave a strong impetus to the expansion of public colleges in the 19th century. The First Morrill Act of 1862 led to the establishment of what became known as land-grant universities (NASULGC 1999). The Second Morrill Act of 1890 expanded the 1862 system of land-grant universities to include black colleges in 17 southern and border states (USDA 2003). After World War II there was further rapid growth of public higher education, particularly at the doctoral level.

The majority of doctoral institutions in the first half of the century were privately controlled; in the last half of the century, public institutions were in the majority and by the 1990s represented 54 percent of all doctorate-granting institutions. There was a corresponding shift in the share of doctorates awarded by public and private institutions, and this shift occurred in both S&E and non-S&E fields (figures 5-8, 5-9). Among the top 50 institutions of Ph.D.s graduating in 1995–99, 15 were privately controlled, compared with 29 in the early 1920s (appendix table B-13). With the growth in public institutions and their share of degrees at all levels, increasing percentages of Ph.D.s earned both their baccalaureate and their doctorate at public institutions (figure 5-10).

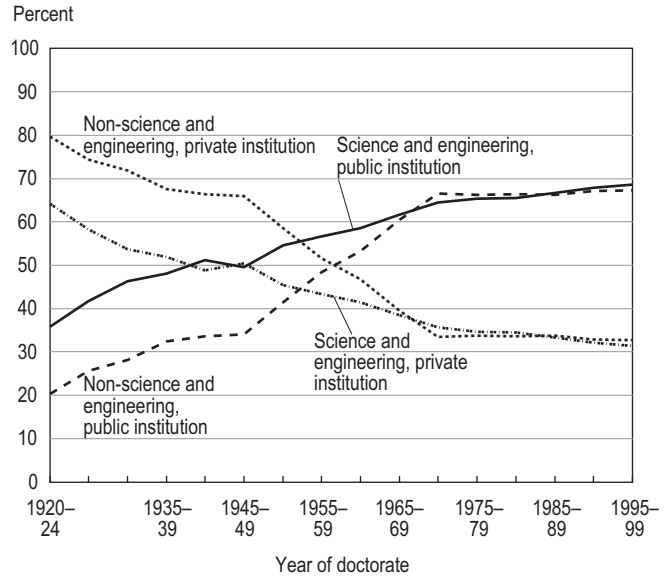
The percentage of doctoral degrees awarded by public institutions was similar among men, women, U.S. citizens, and foreign nationals (table 5-9). Among U.S.

FIGURE 5-8. Doctoral institutions of Ph.D.s, distributed by control of institution: 1920–99



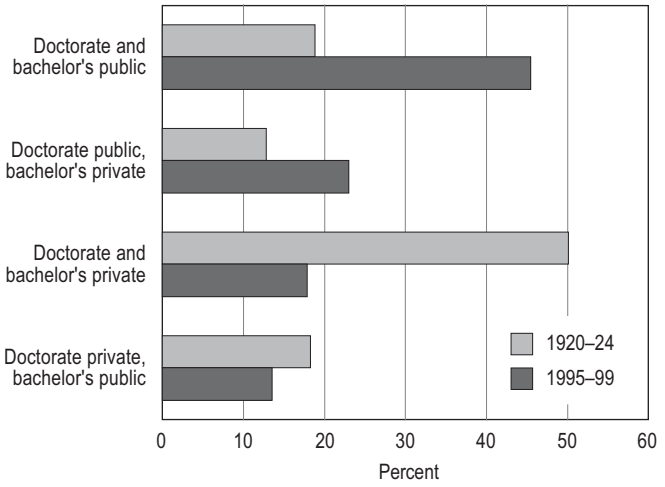
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-9. Control of doctoral institutions of Ph.D.s, by broad field of doctorate: 1920–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-10. Control of baccalaureate and doctoral institutions of Ph.D.s: 1920–24 and 1995–99



NOTE: Percentages are based on number of doctorate holders with U.S. baccalaureates.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

citizens, the small increase in the percentage of Ph.D.s graduating from public institutions from the late 1970s to the late 1990s can be attributed solely to white Ph.D.s (table 5-10). For each of the U.S. minority groups, there was a small increase in the percentage of Ph.D.s earning doctorates at private institutions.

Carnegie Classifications

Institutions that award doctorates have been described in terms of their programs, purposes, and research activity. The 1994 version of the widely used system

TABLE 5-9. Share of doctorates awarded by public and private institutions, by sex and citizenship status of recipient: 1920–24 and 1995–99

(Percent)

Demographic characteristic	1920–24		1995–99	
	Public	Private	Public	Private
All Ph.D.s	30.3	69.7	68.2	31.8
Male	31.5	68.5	68.9	31.1
Female	24.0	76.0	67.2	32.8
U.S. citizen	31.5	68.5	68.1	31.9
Non-U.S. citizen	23.2	76.8	70.0	30.0

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-10. Share of doctorates awarded to U.S. citizens by public and private institutions, by race/ethnicity of recipient: 1975–79 and 1995–99
(Percent)

Race/ethnicity	1975–79		1995–99	
	Public	Private	Public	Private
All U.S. citizens	66.4	33.6	68.1	31.9
American Indian/Alaskan Native	76.6	23.4	76.2	23.8
Asian/Pacific Islander	62.7	37.3	60.3	39.7
Black	65.4	34.6	64.2	35.8
Hispanic	67.0	33.0	66.5	33.5
White	67.1	32.9	69.1	30.9

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

established by the Carnegie Foundation for the Advancement of Teaching was used in this report to classify institutions of Ph.D.s who graduated in 1990–99 (table 5-11). Thus, the data reflect the classification of institutions in 1994.

Most Ph.D.s in the 20th century earned their doctorates at Research I and Research II institutions. There was a slight shift from Research I and II institutions to Doctoral II and other institutions during the 1990s (figure 5-11). S&E Ph.D.s (72 percent) were more likely than non-S&E Ph.D.s (61 percent) to receive their degrees from Research I institutions (table 5-12).

Because of men's greater concentration in S&E fields, it is not surprising that men (71 percent) were more likely than women (64 percent) to earn doctorates at Research I institutions in the 1990s (figure 5-12). Research I institutions were also prominent in the education of foreign students, awarding doctorates to nearly three-fourths of non-U.S.-citizen Ph.D.s, compared with two-thirds of U.S.-citizen Ph.D.s. Of the U.S. racial/ethnic groups, Asians/Pacific Islanders were the most likely to hold doctorates from Research I institutions (76 percent), and blacks (56 percent) and American Indians/Alaskan Natives (54 percent) were the least likely (figure 5-13).

TABLE 5-11. Carnegie classifications of academic institutions

Research Universities I (89)
: Offer full range of baccalaureate programs, are committed to graduate education through the doctorate, award 50 or more doctoral degrees, and receive $40 million or more in federal research support annually

Research Universities II (38)
: Like Research Universities I, but receive $15.5–$40 million in federal research support annually

Doctoral Universities I (50)
: Offer a full range of baccalaureate programs, are committed to graduate education through the doctorate, and award 40 or more doctoral degrees annually in at least five academic disciplines

Doctoral Universities II (58)
: Award 20 or more doctoral degrees annually in at least one discipline or 10 or more doctoral degrees in three disciplines

NOTE: Number of institutions is in parentheses.

SOURCE: Carnegie Foundation for the Advancement of Teaching, 1994.

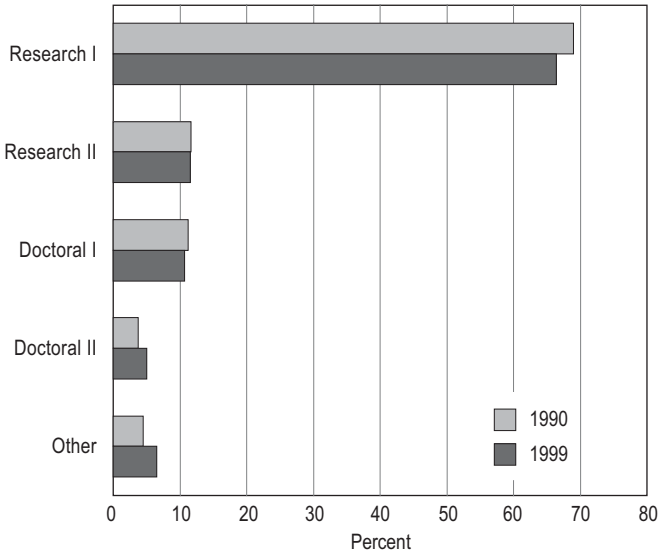
Leading Doctoral Institutions

Although 426 institutions awarded doctorates in the 20th century, Ph.D.s were highly concentrated in a relatively small number of institutions. The top 50 doctoral institutions, based on the number of degrees conferred, accounted for about three-fifths of all doctorates awarded between 1920 and 1999 (figure 5-14). Differential growth in doctoral programs during this 80-year span caused shifts in the institutions constituting the top 10 doctoral institutions and significantly lessened the concentration of awards in a few institutions (table 5-13).

Top Institutions of S&E and Non-S&E Ph.D.s

During the 20th century more institutions awarded doctorates in non-S&E fields (402, or 94 percent of doctorate-granting institutions) than in S&E fields (372, or 87 percent of doctorate-granting institutions). Furthermore, the leading institutions, based on number of doctorates awarded, were different for S&E and non-

FIGURE 5-11. Doctorates awarded, by Carnegie classification of institution: 1990 and 1999



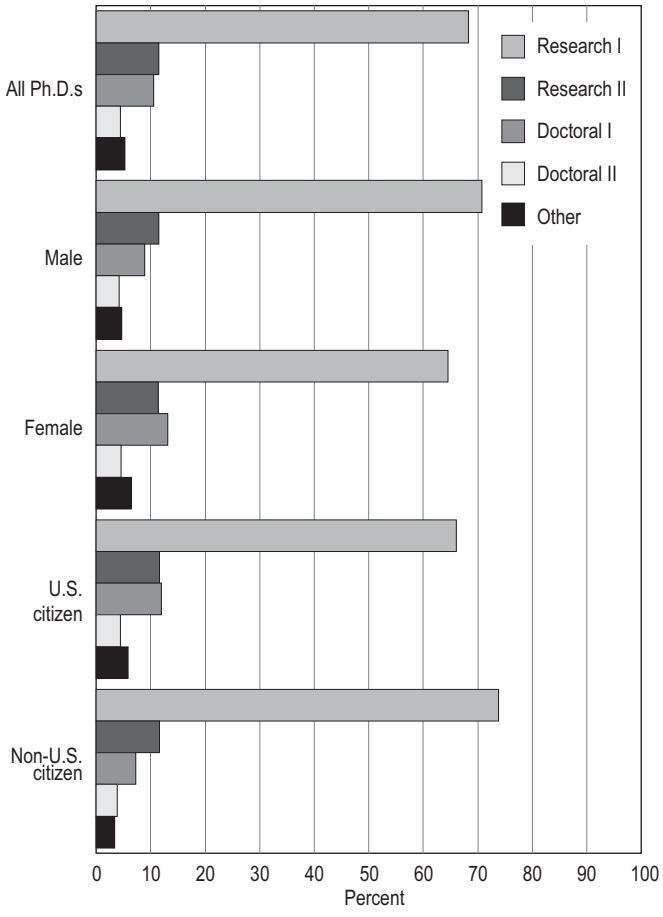
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-12. Carnegie classifications of doctoral institutions of Ph.D.s, by major field of doctorate: 1990–99
(Percent of Ph.D.s)

Field	Research I	Research II	Doctoral I	Doctoral II	Other
All fields	68.3	11.5	10.6	4.4	5.3
Science and engineering	72.1	11.2	7.5	4.3	4.9
Agricultural sciences	78.5	16.6	0.2	3.7	1.1
Biological sciences	73.2	9.1	3.7	3.7	10.3
Earth, atmospheric, and ocean sciences	73.2	13.4	4.9	6.0	2.6
Mathematics and computer sciences	74.8	11.6	8.0	4.9	0.7
Physical sciences	76.3	11.6	6.2	4.8	1.1
Psychology	47.0	12.9	19.5	5.7	14.8
Social sciences	77.4	10.7	8.2	2.5	1.2
Engineering	77.8	10.7	5.5	4.5	1.5
Non-science and engineering	61.4	12.0	16.0	4.5	6.1
Education	49.7	14.5	23.2	7.4	5.3
Health sciences	73.7	7.4	7.0	3.1	8.9
Humanities	75.7	9.0	9.6	1.7	4.1
Professional fields/other	61.2	13.0	12.9	2.3	10.7

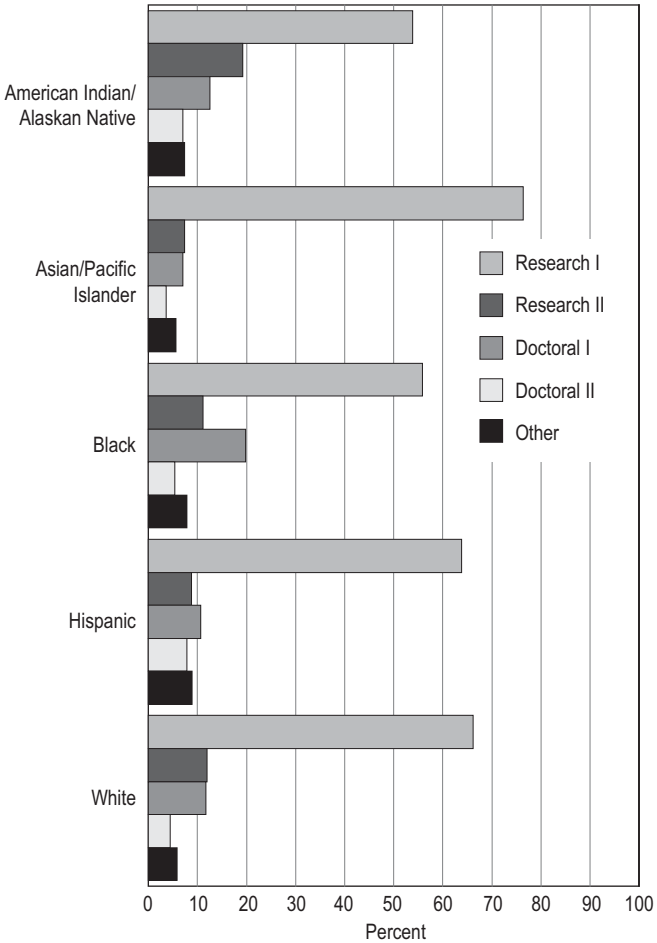
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-12. Carnegie classifications of Ph.D.s' doctoral institutions, by sex and citizenship status of Ph.D.: 1990–99



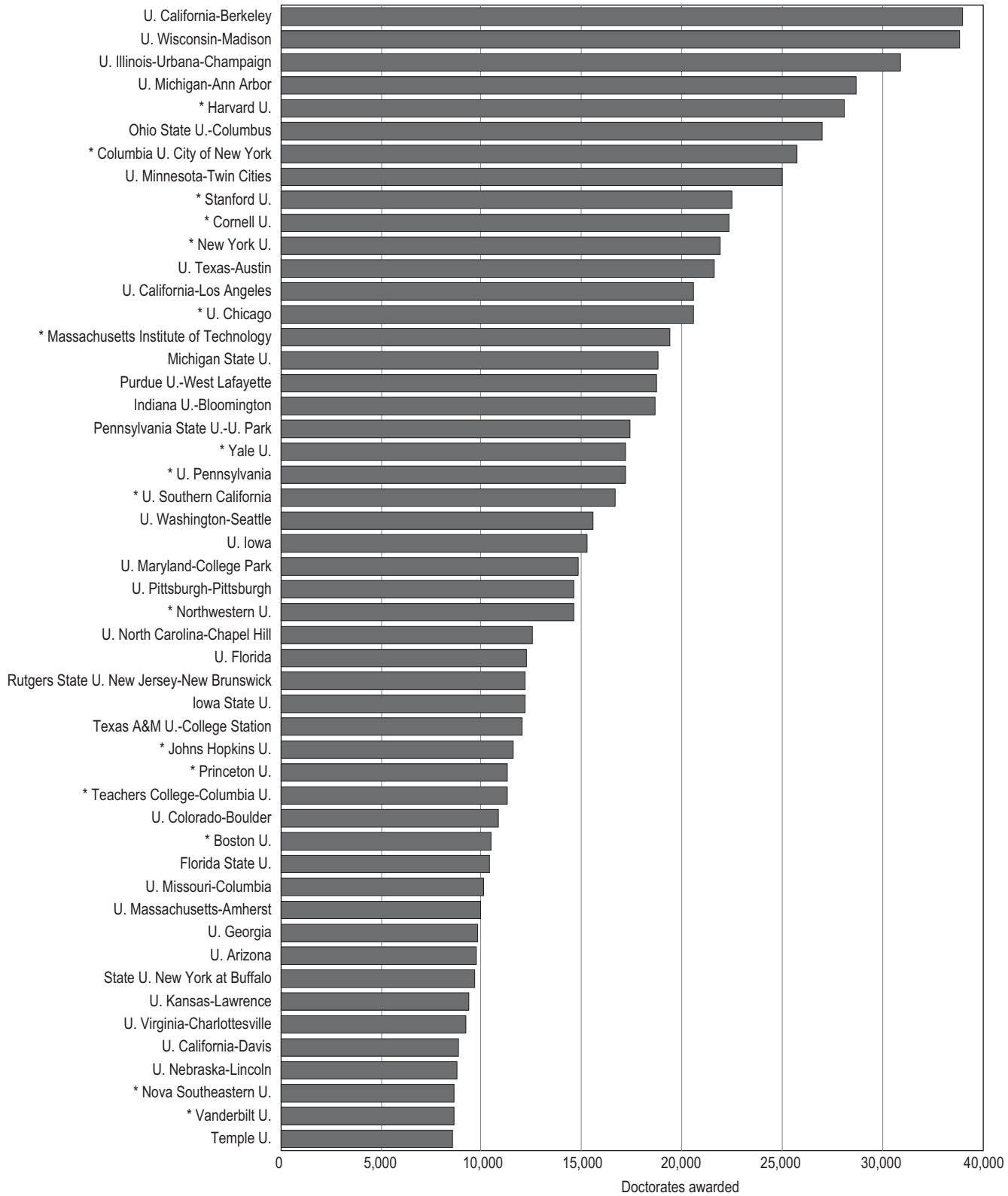
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-13. Carnegie classifications of U.S. citizen Ph.D.s' doctoral institutions, by race/ethnicity of Ph.D.: 1990–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 5-14. Top 50 U.S. doctoral institutions of Ph.D.s, by number of doctorates awarded: 1920–99



* Privately controlled

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-13. Top 10 doctoral institutions of Ph.D.s: 1920–99, 1920–24, and 1995–99

1920–99		1920–24		1995–99	
Doctoral institution	Ph.D.s	Doctoral institution	Ph.D.s	Doctoral institution	Ph.D.s
All institutions	1,354,873	All institutions	4,199	All institutions	210,535
U. California-Berkeley	34,018	U. Chicago*	473	U. Texas-Austin	3,842
U. Wisconsin	33,834	Columbia U.-City NY*	450	U. California-Berkeley	3,819
U. Illinois	30,881	Harvard U.*	371	U. Wisconsin	3,740
U. Michigan	28,662	Johns Hopkins U.*	280	U. Illinois	3,543
Harvard U.*	28,117	U. Wisconsin	272	U. Minnesota	3,495
Ohio State U.	26,962	Cornell U.*	258	U. Michigan	3,381
Columbia U.-City NY*	25,715	Yale U.*	228	Ohio State U.	3,317
U. Minnesota	24,988	U. California-Berkeley	184	U. California-Los Angeles	3,083
Stanford U.*	22,461	U. Illinois	176	Stanford U.*	2,885
Cornell U.*	22,377	U. Pennsylvania*	124	Pennsylvania State U.	2,830
Top 5 as percent of total	11.5	Top 5 as percent of total	44.0	Top 5 as percent of total	8.8
Top 10 as percent of total	20.5	Top 10 as percent of total	67.1	Top 10 as percent of total	16.1

* Privately controlled.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

S&E Ph.D.s (table 5-14, appendix tables B-14, B-15). There was no overlap in the top 5 institutions of S&E and of non-S&E Ph.D.s in the overall period from 1920 to 1999.

Although the number of S&E doctorates awarded by the top 5 institutions for S&E Ph.D.s in 1920–99 was much larger than the number of non-S&E doctorates awarded by the top 5 institutions for non-S&E Ph.D.s, the cumulative shares of doctorates for these institutions were similar. The top 5 institutions on the S&E list conferred 13 percent of all S&E doctorates in 1920–99, a figure only slightly higher than the 11 percent of non-S&E doctorates awarded by the top 5 institutions on the non-S&E list. When these lists are extended to the top 50 institutions for each field, the difference between the shares is miniscule. The percentage of S&E doctorates granted by the top 50 institutions for S&E Ph.D.s was about the same as that granted by the top 50 institutions for non-S&E Ph.D.s (63 percent).

Doctoral Institutions of Men and Women

Opportunities for graduate education, particularly for women, expanded substantially during the 20th century. Most doctoral institutions have from their beginnings awarded degrees to men. For example, in 1920–24, 97 percent of the 60 doctorate institutions awarded doctorates to men, whereas 70 percent awarded doctorates to women. With the large increase over the

TABLE 5-14. Top 5 doctoral institutions of Ph.D.s in order of doctorates awarded, by broad field: 1920–99 and 1995–99

1920–99		1995–99	
Field and doctoral institution	Doctorates	Field and doctoral institution	Doctorates
Science and engineering		Science and engineering	
All institutions	835,221	All institutions	134,271
U. California-Berkeley	25,167	U. California-Berkeley	2,785
U. Wisconsin	22,682	U. Wisconsin	2,617
U. Illinois	21,705	U. Illinois	2,540
Massachusetts Institute of Technology*	18,669	Massachusetts Institute of Technology*	2,380
U. Michigan	18,183	U. Michigan	2,320
Top 5 as percent of total	12.7	Top 5 as percent of total	9.4
Non-science and engineering		Non-science and engineering	
All institutions	519,652	All institutions	76,264
Harvard U. *	12,807	Nova Southeastern U. *	1,977
New York U. *	12,071	U. Texas-Austin	1,556
Indiana U.	11,546	U. Minnesota	1,331
Columbia U.-City of NY *	11,376	Ohio State U.	1,264
Teachers College-Columbia *	11,279	Harvard U. *	1,216
Top 5 as percent of total	11.4	Top 5 as percent of total	9.6

* Privately controlled.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

decades in the number of doctorate-granting institutions and the removal of many barriers to the entry of women into doctoral programs, nearly all institutions were awarding doctorates to women by the end of the century. In 1995–99, 394 (about 98 percent) of the 401 doctorate-granting institutions of that period awarded doctorates to women, and all of them awarded doctorates to men. Women were somewhat less concentrated in their top institutions than men were in theirs (appendix tables B-16, B-17).

Top Institutions of Racial and Ethnical Groups

During the last quarter-century, nearly all doctoral institutions awarded doctorates to whites; three-fourths granted doctorates to Asians/Pacific Islanders, blacks, and Hispanics; and more than half granted doctorates to American Indians/Alaskan Natives.

American Indians/Alaskan Natives

Persons who identified themselves as American Indian/Alaskan Native earned 2,722 doctorates from 274 institutions during the period 1975–99 (appendix table B-18). Consequently, for the entire period, the number of doctorates per top 50 institution for American Indians/Alaskan Natives was small, ranging from a high of 93 to a low of 16. Moreover, although many of the top institutions were located in American Indian population centers, they were spread across 30 states—11 in the Midwest, 9 in the South, 7 in the West, and 3 in the Northeast.

Asians/Pacific Islanders

Asians/Pacific Islanders were markedly more concentrated than other minority groups and whites in their respective top doctoral institutions (appendix table B-19). Almost two-thirds (65 percent) of Asians/Pacific Islanders who earned doctorates between 1975 and 1999 received their degrees from their top 50 institutions. The top 5 doctoral institutions of Asians/Pacific Islanders accounted for nearly one-fifth (just under 18 percent) of all doctorates awarded to the group in 1975–99.

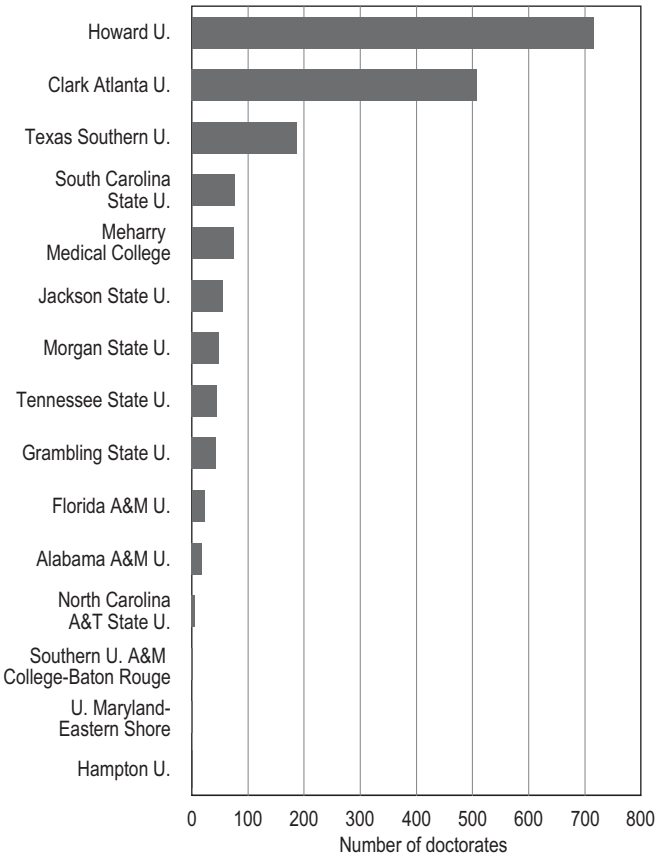
Blacks

The top 50 institutions of blacks conferred 61 percent of their doctorates from 1975 to 1999 (appendix table B-20). Three of the top 50 institutions were HBCUs. In the periods 1975–99 and 1995–99, blacks' concentration in their top 50 institutions was greater than that for whites, about the same as that for American Indians/Alaskan Natives, and less than that for Asians/Pacific Islanders and Hispanics.

Over the years, HBCUs increased their role in the doctoral education of black Ph.D.s. The only doctorate-granting HBCUs in 1975 were Howard University and Clark Atlanta University. By the end of the century an additional 13 HBCUs were awarding doctorates (figure 5-15). In 1995–99, 9 percent (631) of all black Ph.D.s earned their doctorates at HBCUs, more than three times the percentage (3 percent) and more than four times the number (147) in 1975–79.

Although HBCUs primarily serve the black U.S. citizen population, the focus is shifting (table 5-15). In 1975–79, black foreign citizens constituted the second largest group to receive doctorates from HBCUs (24 percent), following black U.S. citizens (56 percent). There was

FIGURE 5-15. Doctorates awarded to black U.S. citizens by HBCUs: 1975–99



HBCU = historically black college or university.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 5-15. Ph.D.s with doctorates from historically black colleges and universities, by citizenship status and race/ethnicity: 1975–79 and 1995–99

(Percent)

Citizenship status and race/ethnicity	1975–79	1995–99
U.S. citizen	64.6	80.7
American Indian/Alaskan Native	0.0	0.6
Asian/Pacific Islander	1.5	1.1
Black	56.3	59.8
Hispanic	0.0	1.5
White	6.5	17.8
Non-U.S. citizen	35.4	19.3
American Indian/Alaskan Native	0.0	0.0
Asian/Pacific Islander	7.3	5.2
Black	23.8	12.5
Hispanic	1.1	0.3
White	3.4	1.2

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

greater diversity in the citizenship status and race/ethnicity of HBCU graduates at the end of the century. By 1995–99, black U.S. citizens earned 60 percent, and black foreign citizens 12 percent, of the doctorates earned at HBCUs. White U.S. citizens were the second largest group in 1995–99, receiving about one-sixth (18 percent) of all HBCU doctorates.

Hispanics

After Asians/Pacific Islanders, Hispanics were the most highly concentrated group with respect to their top 50 institutions. More than three of every five Hispanic Ph.D.s received doctorates from the top 50 institutions on their list, both in the overall 1975–99 period and in the 1995–99 period (appendix table B-21).

Many of the institutions that awarded the largest numbers of doctorates to Hispanics were in places that have large Hispanic populations—Arizona, California, Florida, New Mexico, New York, Puerto Rico, and Texas.

Whites

More than half (54 percent) of all whites who received doctorates between 1975 and 1999 graduated from the top 50 institutions on their list, and 9 percent graduated from the top 5 institutions (appendix table B-22).

REFERENCES

Carnegie Foundation for the Advancement of Teaching. 1994. *A Classification of Institutions of Higher Education.* Princeton, NJ.

Kane, J.N., S. Anzovin, and J. Podell. 1997. *Famous First Facts: A Record of First Happenings, Discoveries, and Inventions in American History.* 5th ed. New York: H.W. Wilson Company.

National Association of State Universities and Land-Grant Colleges (NASULGC). 1999. The land-grant tradition. http://www.nasulgc.org/publications/Land_Grant/Land_Grant_Main.htm. Accessed April 2005.

National Science Foundation (NSF). 1975–2000. *Women, Minorities, and Persons With Disabilities in Science and Engineering: 1973…2000*. Biennial series. Arlington, VA.

National Science Foundation (NSF). 1990. *Selected Data on Historically Black Colleges and Universities, Academic Year 1988*. Washington, DC.

U.S. Department of Agriculture (USDA). 2003. 1890 land grant universities. http://www.reeusda.gov/1890. Accessed March 2003.

U.S. Department of Education, National Center for Education Statistics (USED/NCES). 1985. The traditionally black institutions of higher education, 1860 to 1982. Washington, DC. http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=84308. Accessed April 2005.

U.S. Department of Education, National Center for Education Statistics (USED/NCES). 1996. *Historically Black Colleges and Universities, 1976–1994*. Washington, DC.

White House Initiative on Historically Black Colleges and Universities. 2002. http://www.ed.gov/about/inits/list/whhbcu/edlite-index.html. Accessed April 2005.

CHAPTER 6. AFTER THE DOCTORATE

Highlights

- **Postgraduation Status.** The percentage of new Ph.D.s with definite plans (commitments) following graduation declined from about 77 percent in 1970–74 to 68 percent in 1995–99.

- **Location of Postgraduation Commitments.** Historically, about 9 in 10 Ph.D.s with definite postgraduation plans have remained in the United States, a stay rate that has changed little over the years. Differences in stay rates among major fields of study reflect the constituent proportion of foreign nationals, particularly temporary residents, in major fields.

- **Postgraduation Study Commitments in the United States.** The percentage of Ph.D.s with definite plans to remain in the United States to pursue further study nearly doubled between the early 1970s and the late 1990s, reaching about 27 percent in the latter period.

  The percentage of Ph.D.s with study commitments who planned to be in academic settings dropped from about 82 percent in the early 1970s to less than 78 percent by 1995–96.

- **Postgraduation Employment Commitments in the United States.** In 1995–99 about 70 percent of new Ph.D.s reported having a postgraduate commitment to employment in the United States, a proportion down from 85 percent in 1970–74.

  Employment Sectors. Academic job commitments among new Ph.D.s declined from about 67 percent in the early 1970s to about 50 percent by the end of that decade, a mark that remained steady for the remainder of the century.

  The percentage of Ph.D.s going into industry more than doubled, from 12 percent in the early 1970s to 27 percent in the late 1990s.

  Primary Work Activities. Only 38 percent of Ph.D.s in 1995–99, compared with 57 percent in 1970–74, expected to spend most of their time teaching. Nearly 31 percent of Ph.D.s in the late 1990s planned to be engaged mostly in R&D, up from 23 percent in the early 1970s.

  Interstate Migration. Ph.D.s with definite postgraduation commitments increasingly stayed in the same state as their doctoral institution, 47 percent in 1995–99, up from 37 percent in 1970–74.

INTRODUCTION

At graduation, Ph.D.s are on the threshold of a new phase in their careers. Some continue their studies as postdoctoral fellows or research associates. Others enter employment in academe, industry, government, or other sector or continue in or return to jobs they held before graduation. Some foreign nationals stay in the United States, whereas others return to their native country or have other destinations abroad. All of these plans and intentions vary greatly in their degree of certainty, ranging from signed contracts to pending negotiations.

Since the late 1960s the SED has requested data on Ph.D.s' plans for the period immediately following graduation. This information reveals how many new Ph.D.s have firm commitments for jobs or postdoctoral study appointments. From those who plan to work, information is requested about the employment sector—academe, industry, nonprofit, government, or other. Information is also requested about how these Ph.D.s plan to spend most of their time on the job—in research and development, teaching, administration, or professional services. Ph.D.s who are pursuing further study are asked about their major source of financial support (e.g., government, university), their financial support mechanism (e.g., postdoctoral fellowship or research associateship), and their study setting (e.g., university, government, or industrial laboratory). From information about new Ph.D.s' reported destinations after receipt of the doctorate, it is possible also to examine their migration patterns.

This chapter examines reports from Ph.D.s who had definite plans for work or study at the time they completed

the SED, usually during the final weeks of their doctoral education. The percentages of foreign citizens from the five world regions (Africa, Americas, Asia, Australasia/Pacific, Europe) and various countries who planned to stay in the United States after earning the doctorate (stay rate) are also examined. Concentrating on Ph.D.s with definite plans allows more reliable comparisons across time. Ph.D.s who had signed a contract or otherwise made a firm commitment for work or study by the time they completed the survey were considered to have definite plans at the time of graduation. Those negotiating with one or more organizations and those still seeking a position with no specific prospects at the time they completed the survey were considered not to have definite plans. The terms "definite plans" and "commitments" are used interchangeably in this chapter. The data on postgraduation plans are presented for 5-year periods from 1970 to 1999.

Past trends may not necessarily be good predictors of the future. The first years of the 21st century differ in many ways from the 1990s, for example, in terms of U.S. and global economic conditions. Of potentially great importance is the influence that the war on terrorism may have on doctoral education in the United States in the years to come and on career options for Ph.D.s both here and abroad.

Postgraduation Status

During the last three decades of the 20th century, there was a gradual decline in the proportion of new Ph.D.s with definite plans at graduation (figure 6-1). About three-fourths (77 percent) of all new Ph.D.s in 1970–74 reported commitments. By 1995–99, that proportion had dropped to about two-thirds (68 percent).

Overall, the level of postgraduation commitments was about the same for S&E and non-S&E Ph.D.s—76 percent in 1970–74 and 68 percent in 1995–99 (figure 6-2). Major fields of study with the highest commitment levels in 1995–99 were education (74 percent), professional and other fields (74 percent), biological sciences (73 percent), health sciences (71 percent), and physical sciences (70 percent). Humanities Ph.D.s were the least likely to have definite plans at graduation in 1995–99 (58 percent), followed by agricultural sciences Ph.D.s (62 percent).

The gap between men and women in terms of definite postgraduation plans closed between 1970–74 and 1995–99. The percentage of men who had definite postgraduation plans declined 10 percentage points in that period, whereas the percentage of women with definite plans remained virtually unchanged. By century's end, about 68 percent of each group had definite plans at graduation (table 6-1).

The decline among men accounted for the overall change in postgraduation commitments between 1970–74 and 1995–99, a trend influenced by the large number of foreign nationals receiving doctorates in the 1980s and 1990s. About four in five non-U.S.-citizen Ph.D.s were men, and foreign nationals are less likely than U.S. citizens to have definite plans at graduation, contributing to the decrease in postgraduate commitments among men overall. About 63 percent of temporary residents and 59 percent of permanent residents who received doctorates in 1995–99 reported commitments for work or study after graduation, compared with 71 percent of U.S. citizens.

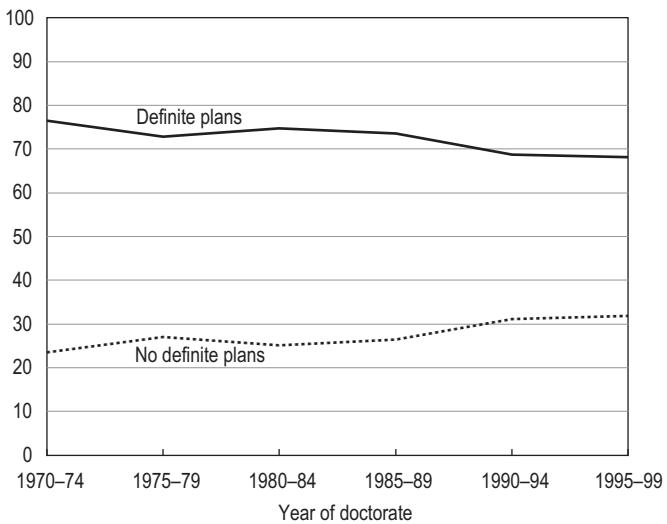
TABLE 6-1. Ph.D.s with definite postgraduation plans, by sex and citizenship status: 1970–74 and 1995–99

(Percent)

Demographic characteristic	1970–74	1995–99
All Ph.D.s	76.5	68.1
Male	78.3	68.4
Female	67.4	67.5
U.S. citizen	78.2	70.6
Permanent resident	61.2	59.3
Temporary resident	70.7	63.3

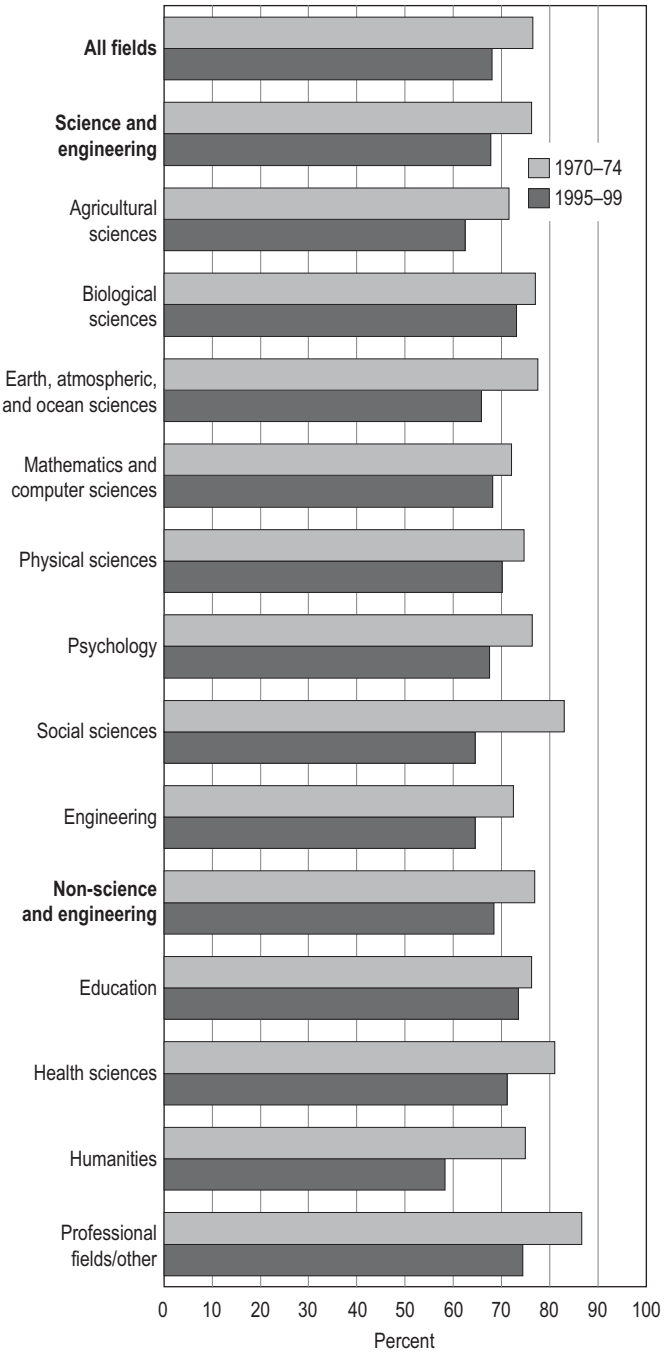
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-1. Postgraduation plans of Ph.D.s: 1970–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-2. Ph.D.s with definite postgraduation plans, by major field of doctorate: 1970–74 and 1995–99



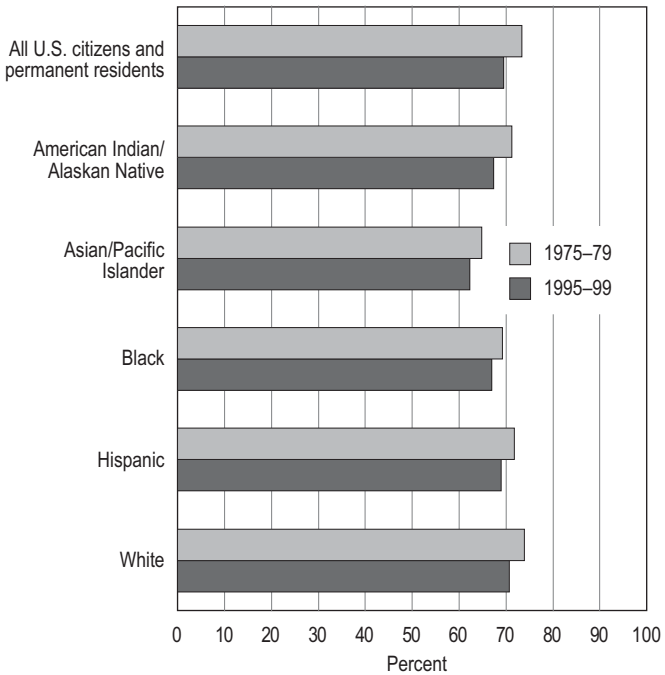
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Because permanent residents are likely to become long-term members of the U.S. labor force, they are grouped with U.S. citizens in the racial/ethnic analyses presented in this chapter. Most analyses of race/ethnicity in the earlier chapters focused only on U.S. citizens.[1] Within the combined group of U.S. citizens and permanent residents, every racial/ethnic group experienced decreases in postgraduation commitments during the last quarter century (figure 6-3). White Ph.D.s had the highest level of commitments (more than 70 percent in both 1975–79 and 1995–99), followed by Hispanics, American Indians/Alaskan Natives, blacks, and Asians/Pacific Islanders. The last group was the only one in which less than two-thirds of Ph.D.s reported commitments—a reflection of the large concentration of permanent residents (the citizenship group with the lowest commitment rates) among Asians/Pacific Islanders.

Location of Postgraduation Commitments

About 90 percent of Ph.D.s with definite postgraduation plans indicated they would remain in the United States after graduation, a stay rate that has changed little over the years (figure 6-4). What has changed is the distribution of postgraduation plans between work and study. Increasingly, new Ph.D.s plan to continue their studies with postdoctoral appointments. In 1970–74, 77 percent of all Ph.D.s with commitments intended to stay in the United States for a job, compared with about 14 percent who planned to pursue further study in U.S. institutions; the remainder had commitments abroad. By 1995–99 the percentage of Ph.D.s with study commitments in the United States had nearly doubled, to about 27 percent, whereas the percentage with job commitments had decreased to about 63 percent.

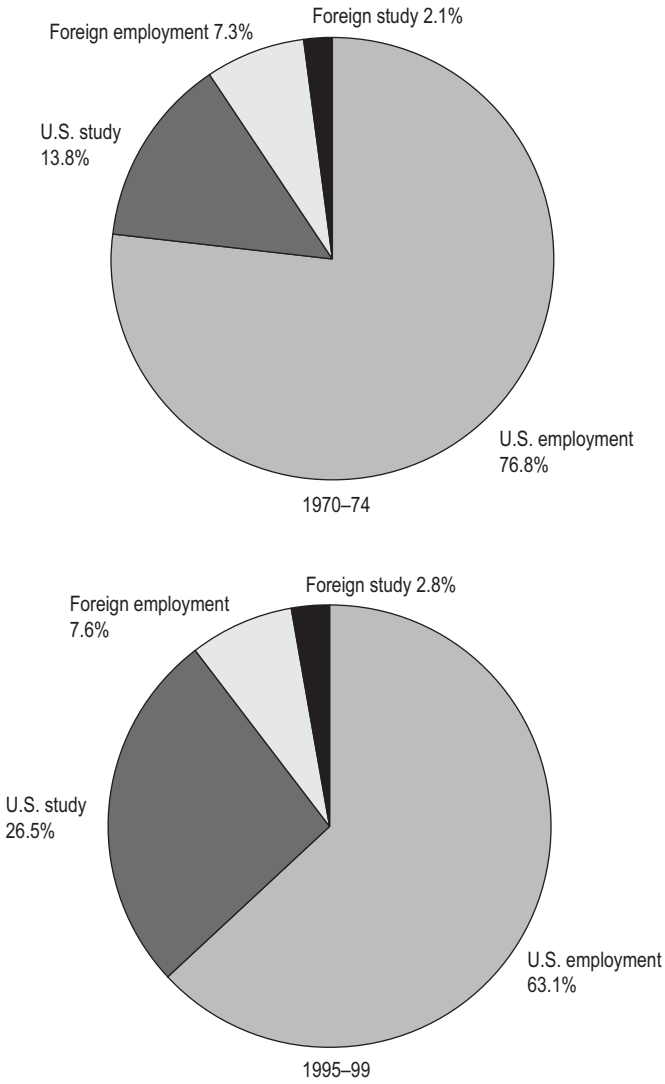
FIGURE 6-3. U.S. citizen and permanent resident Ph.D.s with definite postgraduation plans, by race/ethnicity: 1975–79 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

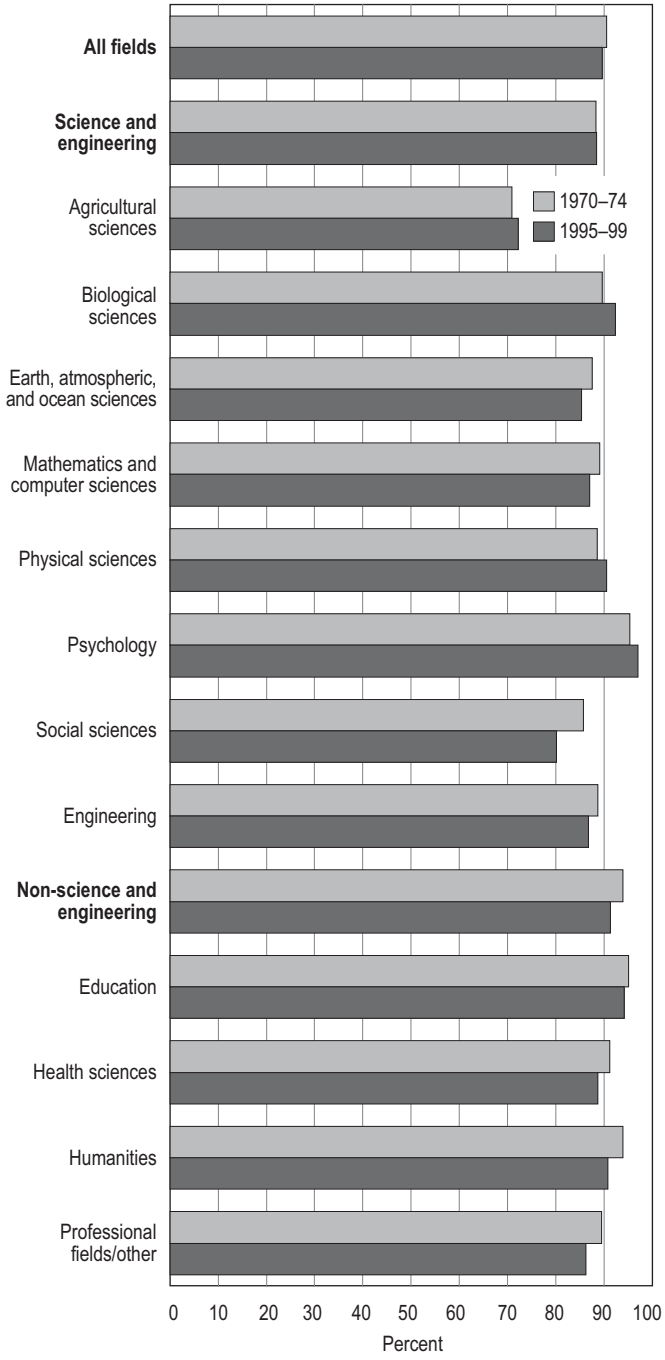
[1] Data on race/ethnicity are available for the period 1975–99.

FIGURE 6-4. Location and kinds of postgraduation plans of Ph.D.s with definite plans: 1970–74 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-5. Ph.D.s with definite plans to stay in the United States after graduation, by major field of doctorate: 1970–74 and 1995–99



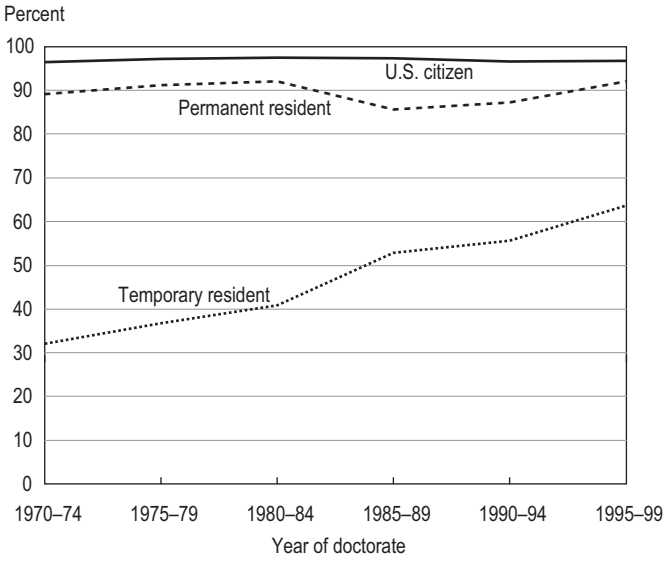
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The stay rates by field show relatively little variation over the years. The rate for social sciences Ph.D.s declined about 6 percentage points between 1970–74 and 1995–99, the largest decrease of any field (figure 6-5). The largest increase, nearly 3 percentage points, was among biological sciences Ph.D.s.

The differences among fields reflect the varying concentrations of U.S. and non-U.S. citizens. Citizenship status is the primary factor related to whether a doctorate recipient remains in the United States after graduation. From the early 1970s to the late 1990s, nearly all U.S. citizens had definite plans to stay in this country, as did about 90 percent of permanent residents who had commitments at graduation (figure 6-6). Most had plans for work rather than for further study.

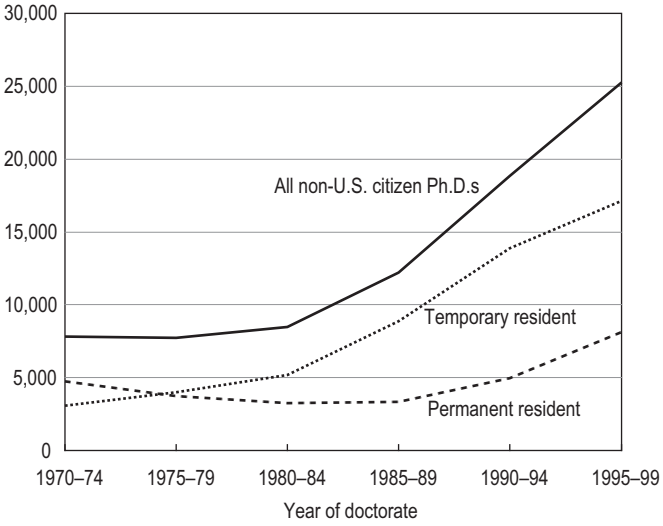
The stay rate of temporary resident Ph.D.s is lower but has increased during the last 30 years of the century, from less than one-third in 1970–74 to nearly two-thirds in 1995–99. During this time, the number of temporary resident Ph.D.s with definite plans to stay in the United States after graduation increased nearly sixfold—from 3,068 to 17,150 (figure 6-7). These Ph.D.s were about evenly divided between work and study commitments.

FIGURE 6-6. Ph.D.s with definite plans to stay in the United States after graduation, by citizenship status: 1970–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-7. Non-U.S. citizen Ph.D.s with definite plans to stay in the United States after graduation, by visa status: 1970–99



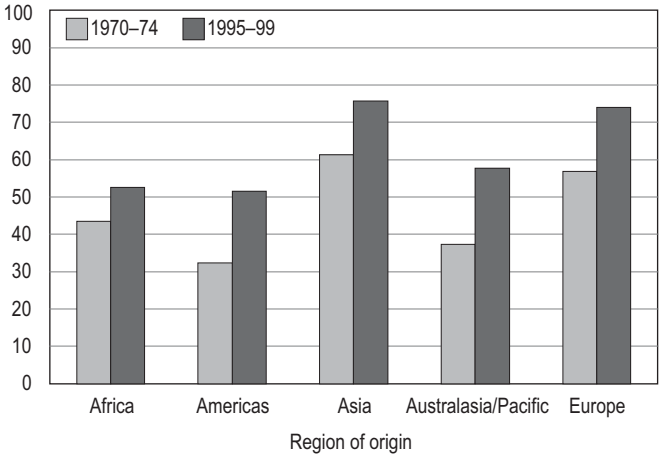
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The stay rate of foreign national Ph.D.s from each of the five world regions rose substantially between the 1970–74 and 1995–99 periods (figure 6-8). In 1970–74 Asia and Europe were the only regions that had a majority of citizens with definite plans to stay in the United States after earning a U.S. doctorate. By the late 1990s, a majority of Ph.D.s from every region planned to remain in the United States—about 75 percent of Asians and Europeans and 51 to 58 percent of citizens of other regions. Between 1970–74 and 1995–99 the number of Asian-citizen Ph.D.s with postgraduation plans to stay in the United States quadrupled, from 4,078 to 17,233 (table 6-2).

A striking change has occurred over the years in the visa status of non-U.S.-citizen Ph.D.s with commitments in the United States. Permanent residents made up nearly 59 percent of all non-U.S. citizens in 1970–74 who had definite plans to stay after graduation. By the late 1990s, temporary residents with U.S. commitments outnumbered permanent residents 2 to 1, both overall and among Ph.D.s from each world region.

In recent years more Ph.D.s from China and India than from any other country remained in the United States after graduation (figure 6-9). During the 1995–99

FIGURE 6-8. Non-U.S. citizen Ph.D.s with definite plans to stay in the United States after graduation, by region of origin: 1970–74 and 1995–99



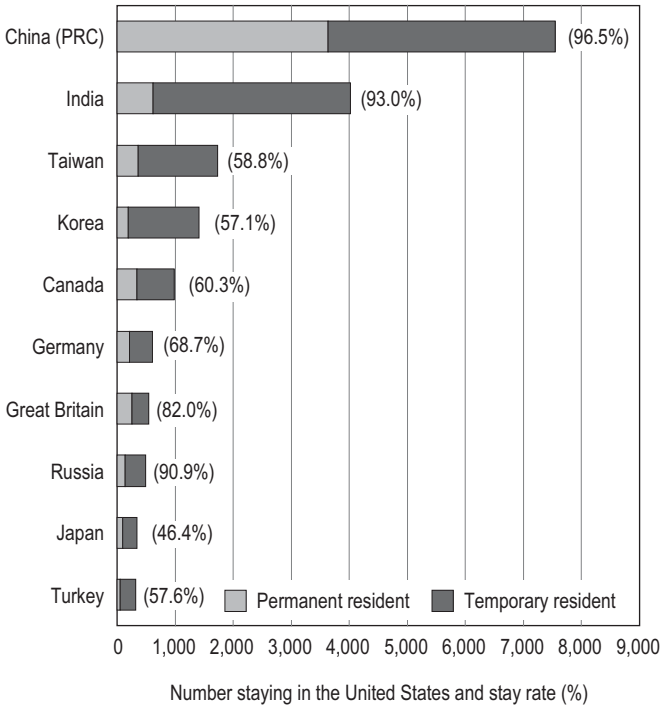
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 6-2. Non-U.S. citizen Ph.D.s staying in the United States after graduation, by region of origin and visa status: 1970–74 and 1995–99

Region	All non-U.S. citizens	Permanent residents	Temporary residents
Africa			
1970–74	406	194	212
1995–99	653	211	442
Americas			
1970–74	1,120	606	514
1995–99	2,263	778	1,485
Asia			
1970–74	4,078	2,426	1,652
1995–99	17,233	5,491	11,742
Australasia/Pacific			
1970–74	189	87	102
1995–99	237	75	162
Europe			
1970–74	1,357	887	470
1995–99	4,241	1,399	2,842

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-9. Top 10 origins of non-U.S. citizen Ph.D.s with definite plans to stay in the United States after graduation, by visa status: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

period, 7,548 Chinese citizens intended to stay (96 percent of all Chinese Ph.D.s with definite plans). Russia is noteworthy because 91 percent of its citizens planned to remain in the United States after receiving their doctorates.

Because these numbers and percentages represent only those non-U.S. citizens who reported definite plans to stay in the United States after graduation, estimates may be conservative. The restriction to definite plans is necessary when examining long-term trends because until 1990, location was captured in the survey item on postdoctoral affiliation, which was generally completed by only those Ph.D.s with definite plans.

Beginning in the 1990s doctorate recipients were asked to report location separately, resulting in more complete data on the intended locations of new Ph.D.s. Data from the 1990s show that a substantial number of non-U.S. citizens who did not report commitments did report intentions to remain in the United States.[2]

[2] Appendix table C-1 compares 1995–99 aggregate data for non-U.S. citizens who reported definite postgraduation plans in the United States (the population shown in table 6-2 and figures 6-8 and 6-9) with the corresponding data for all non-U.S. citizens who reported location, including those who did not report definite plans. The table provides comparisons for each of the 5 world regions and for the 10 leading country origins of Ph.D.s.

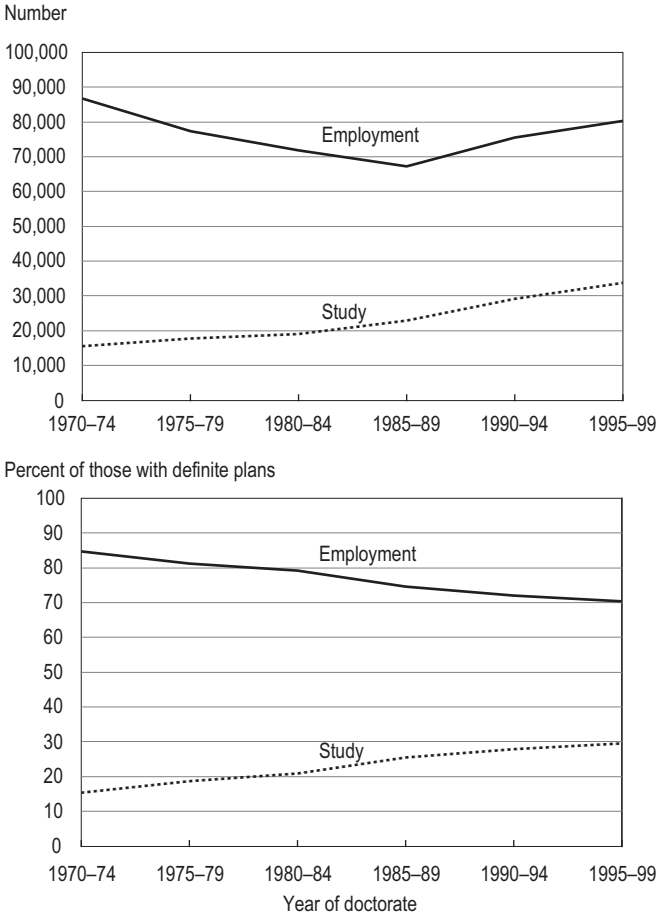
Kinds of Postgraduation Commitments in the United States

The postgraduation commitments of Ph.D.s who had definite plans to remain in the United States show a gradual shift toward further study. By the late 1990s about 27 percent of new Ph.D.s who intended to remain in the United States had study commitments, nearly double the percentage in the early 1970s. In contrast, the percentage of Ph.D.s with employment commitments in the United States dropped throughout the last quarter of the century, even though the number with employment commitments rose in the 1990s (figure 6-10). This reversal reflects both the growth in doctorate production during this period and the abundance of technology-related jobs in the 1990s.

Postgraduation Study Commitments

Although the trend toward further study is evident in all major fields, Ph.D.s in S&E fields are more likely than

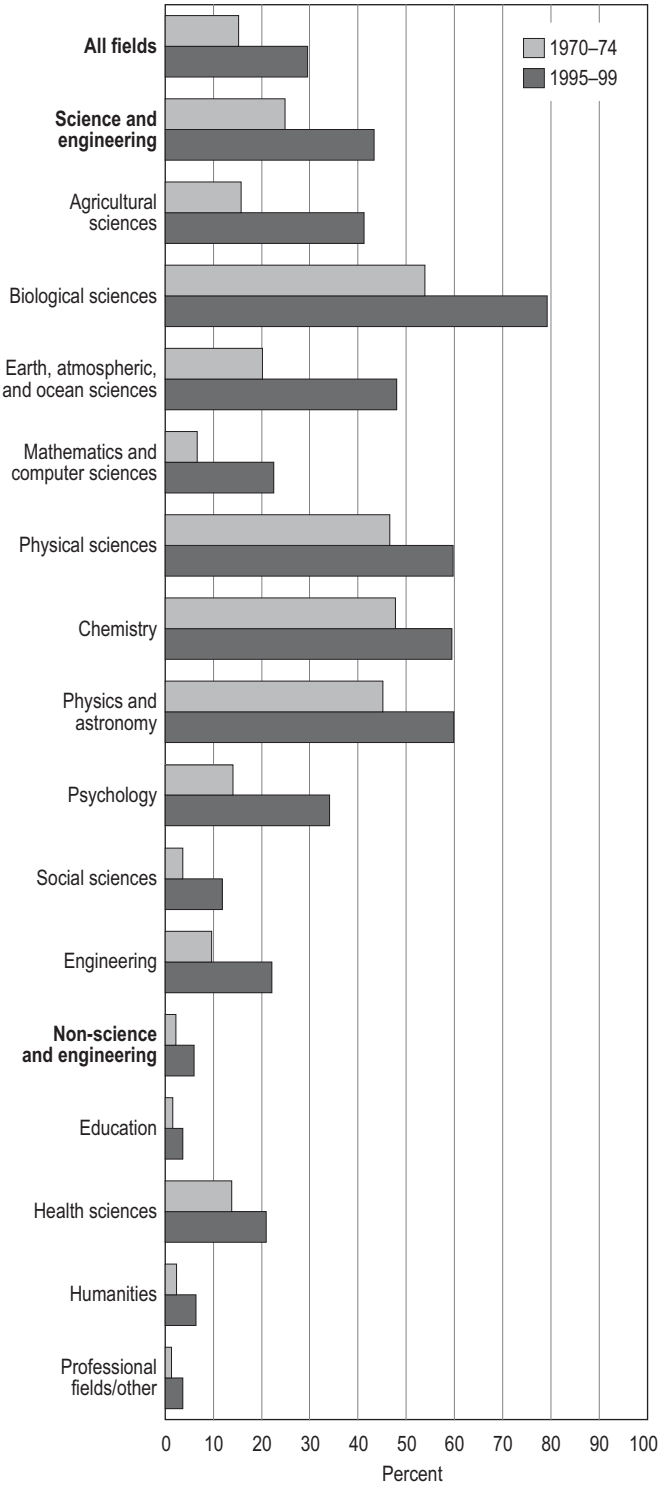
FIGURE 6-10. Ph.D.s with definite plans for U.S. postgraduation employment and study: 1970–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

those in non-S&E fields to undertake such study (figure 6-11). About 43 percent (31,240) of all S&E Ph.D.s graduating in 1995–99 with U.S. commitments reported plans for further study, up from 25 percent (14,659) in 1970–74. Further study is most prevalent in biological sciences. Of the biological sciences Ph.D.s graduating in 1995–99 with U.S. postgraduation commitments, 79 percent (13,903) had plans for postdoctoral study, up from 54 percent (6,100) in the 1970–74 period. The proportions of new Ph.D.s undertaking postdoctoral study in the combined field of physics and astronomy and in chemistry were also high, each being about 60 percent in 1995–99.

FIGURE 6-11. Ph.D.s with definite plans for U.S. postgraduation study, by major field of doctorate: 1970–74 and 1995–99



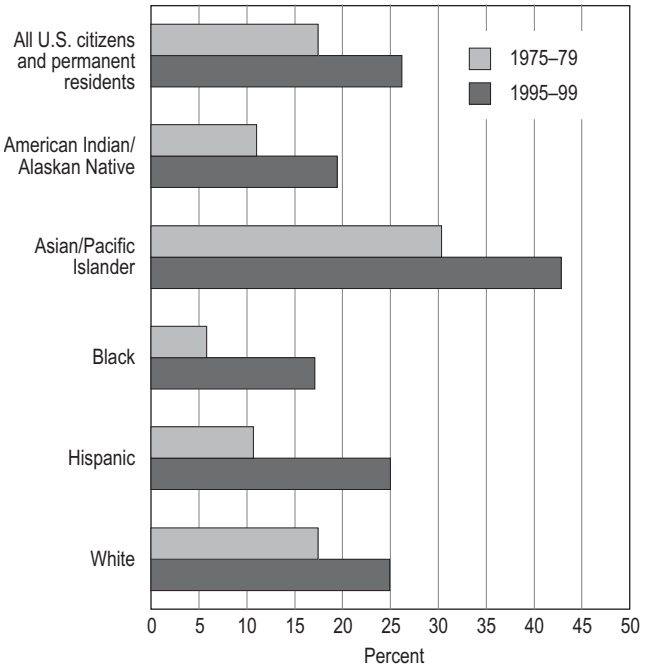
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The proportions of U.S. citizens and permanent residents reporting postgraduation study commitments in the United States rose for each racial/ethnic group between 1975–79 and 1995–99. Demographic differences among Ph.D.s with postgraduation study commitments generally reflect the field concentrations of individual groups. The largest proportions of Ph.D.s planning postdoctoral study are in those demographic groups that have the highest concentrations in biological and physical sciences, with the proportion for Asians and Pacific Islanders greatest in both time periods (figure 6-12).

Financial Support Mechanisms

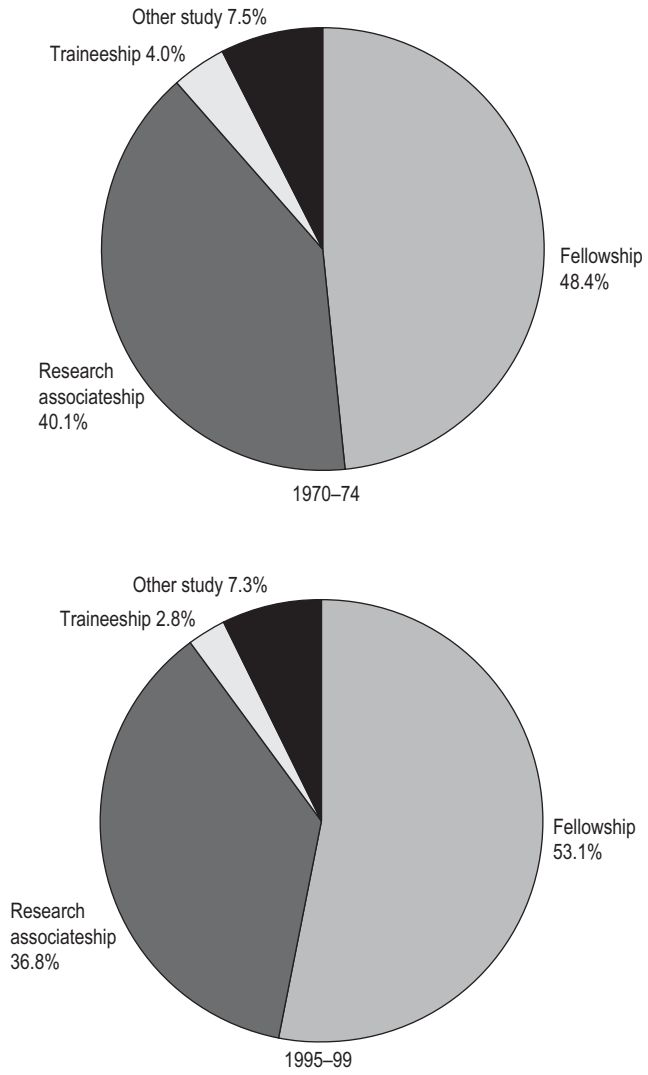
Fellowships are the main support mechanism for Ph.D.s undertaking postdoctoral study (figure 6-13). The proportion of Ph.D.s supported by fellowships rose from 48 percent in 1970–74 to 53 percent in 1995–99. The citizenship status of Ph.D.s affects their eligibility for the kinds of financial support available for postdoctoral study. Temporary

FIGURE 6-12. U.S. citizen and permanent resident Ph.D.s with definite plans for U.S. postgraduation study, by race/ethnicity: 1975–79 and 1995–99



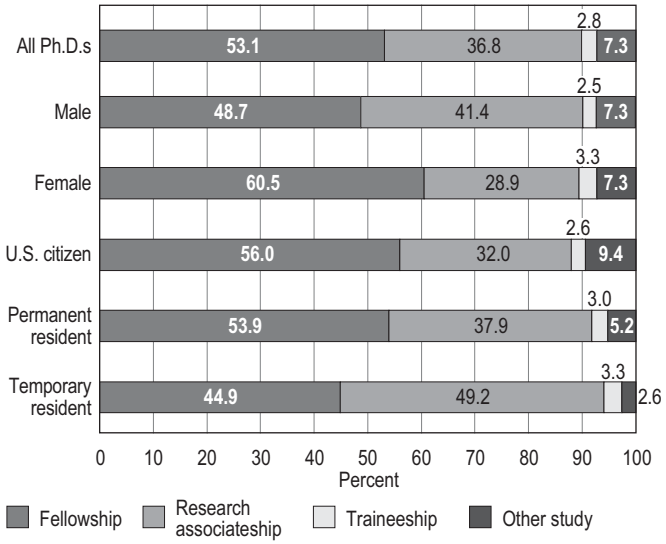
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-13. Financial support mechanisms of Ph.D.s with U.S. postgraduation study commitments: 1970–74 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-14. Financial support mechanisms of Ph.D.s with U.S. postgraduation study commitments, by sex and citizenship status: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

residents, who are ineligible for many postdoctoral fellowships funded by the U.S. government, are more likely to receive their support from research associateships than from other forms of support (figure 6-14).

Sources of Financial Support

Most funding for postdoctoral study comes from the U.S. government and from academic institutions. Although government sources were reported most often as a source of support, the share of postgraduation study commitments supported by government sources declined 13 percentage points between 1975–79 and 1995–99. The share supported by academic institutions increased 10 percentage points in the same period (figure 6-15). In both 1975–79 and 1995–99, private foundations and nonprofit organizations were the main sources of support for about 10 percent and 3 percent of new Ph.D.s, respectively.

Although government support was the primary mechanism for more than half of postgraduation study commitments for several fields in 1975–79, the only field in which the government supported a majority of new Ph.D.s entering postdoctoral study in 1995–99 was earth, atmospheric, and ocean sciences (figure 6-16).

Study Settings

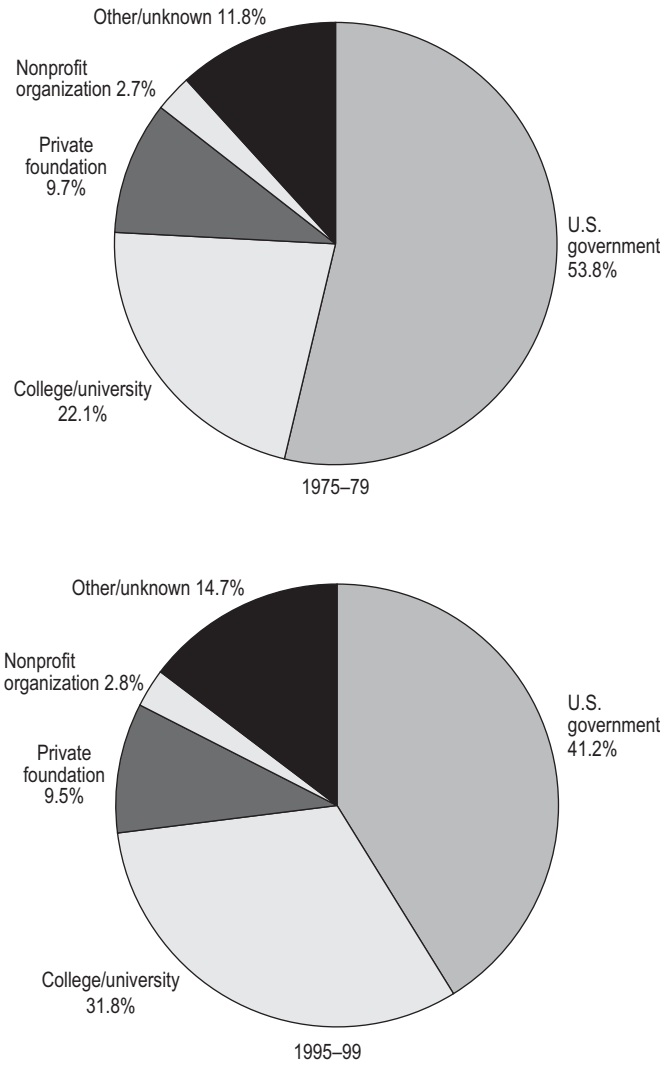
In both 1970–74 and 1995–96, more than three-fourths of new Ph.D.s with postdoctoral appointments found those positions at universities or colleges (figure 6-17).[3] The percentage of new Ph.D.s with study commitments who planned to be in academic settings declined, however, from 82 percent of the 1970–74 cohort to 78 percent of the 1995–96 cohort. This decline reflects a shift over this period, as Ph.D.s increasingly accepted postdoctoral appointments at U.S. government facilities, industries, and nonprofit organizations.

Postgraduation Employment Commitments

Although the percentage of new Ph.D.s with study commitments increased during the last three decades of the century, the great majority of Ph.D.s with definite postgraduation plans in the United States had employ-

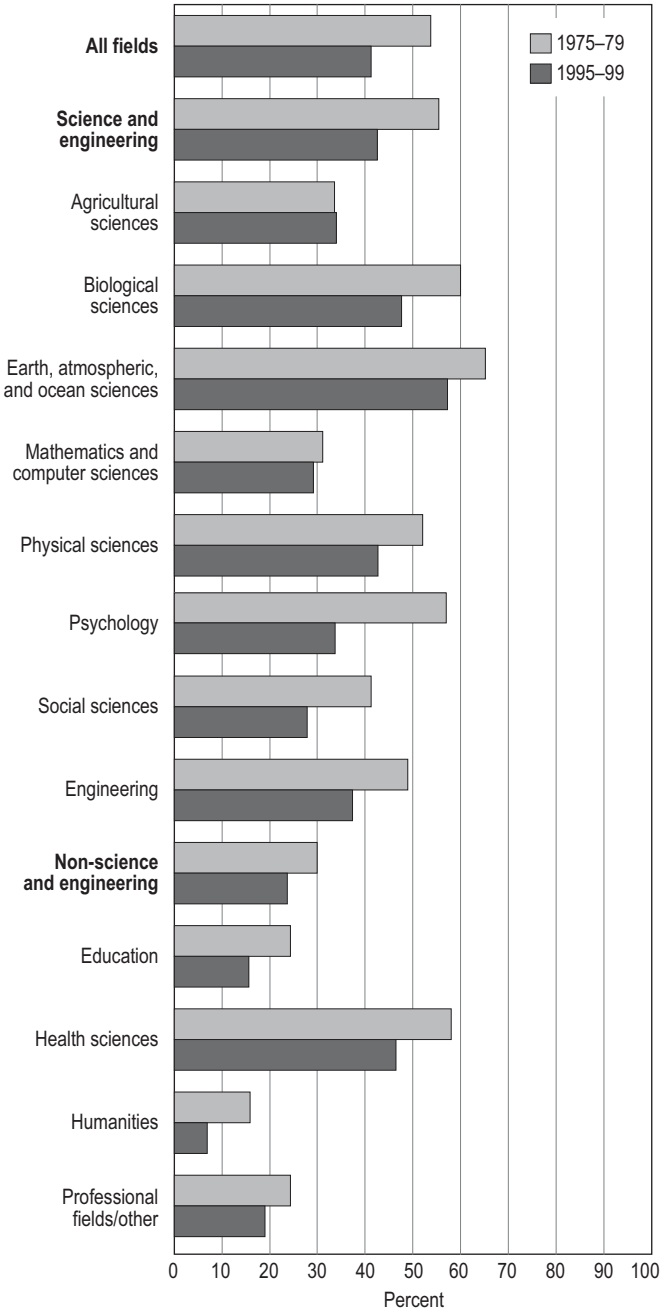
[3] The most recent data covering all possible study settings are for 1995 and 1996.

FIGURE 6-15. Sources of support for Ph.D.s with U.S. postgraduation study commitments: 1975–79 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-16. U.S. government as main support for Ph.D.s with U.S. postgraduation study commitments, by major field of doctorate: 1975–79 and 1995–99

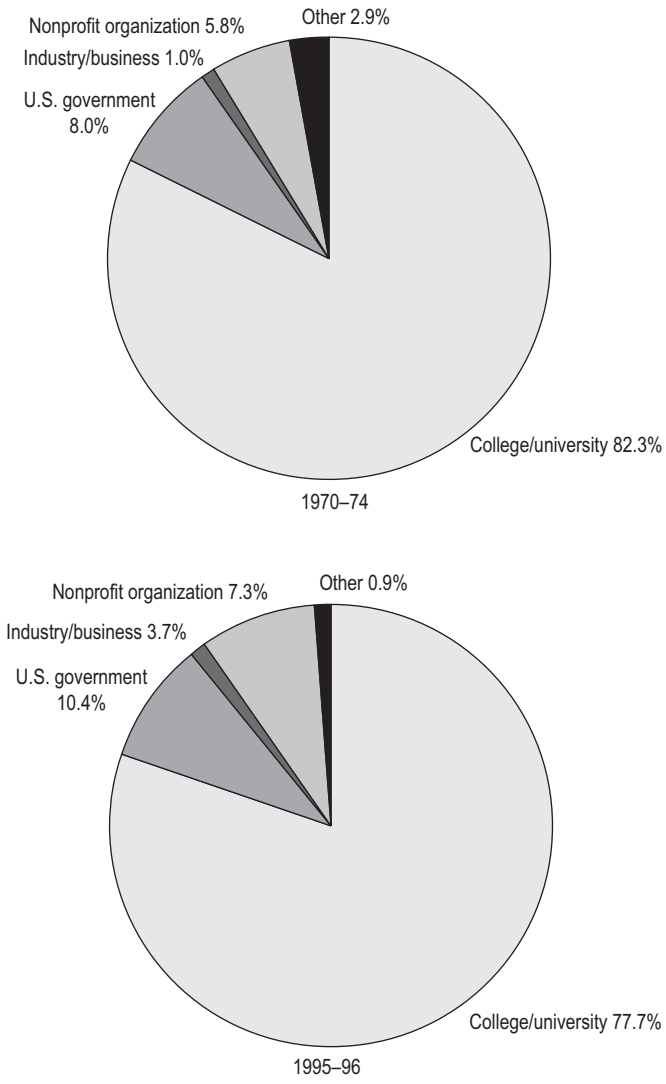


SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

ment commitments. Even after steady declines since 1970–74, when this information was first collected, 70 percent of Ph.D.s who graduated in 1995–99 with employment commitments in the United States either had new jobs or returned to jobs held before graduation (figure 6-18).

The increase in the proportion of Ph.D.s reporting postgraduation study commitments during the last 30 years accompanied a decline in the proportion of both U.S. citizen and permanent resident Ph.D.s who reported work plans. In 1970–74, 86 percent of U.S. citizens and 72 percent of permanent residents had job commitments after graduation. At the end of the century, 75 percent of U.S. citizens and 59 percent of permanent residents reported work commitments. Work commitments among temporary residents, however, changed little except for a spike in the early 1980s. In most periods about 50 percent of temporary residents with definite plans to stay in the United States had jobs. Work commitments also spiked among permanent residents in the early 1980s, after which the proportion reporting job commitments declined. Among U.S.-citizen Ph.D.s, the proportion reporting work commitments decreased steadily through the end of the century.

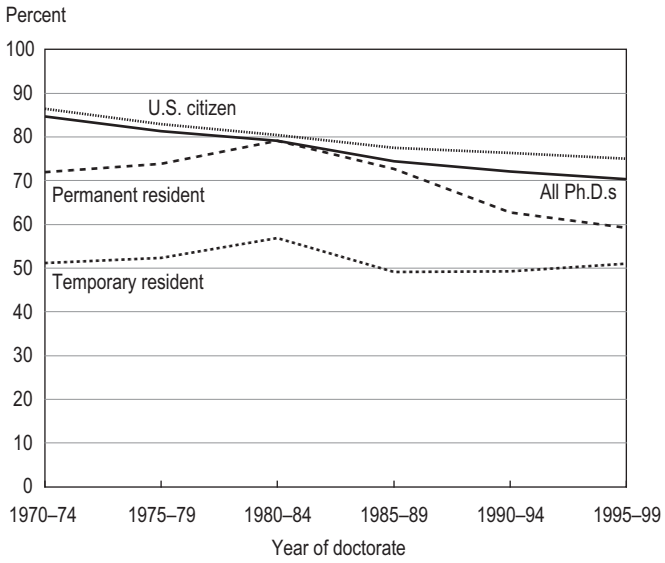
FIGURE 6-17. Study settings of Ph.D.s with U.S. postgraduation study commitments: 1970–74 and 1995–96



NOTE: Nonacademic settings were not coded in 1997–99.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-18. Ph.D.s with definite plans for U.S. postgraduation employment, by citizenship status: 1970–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

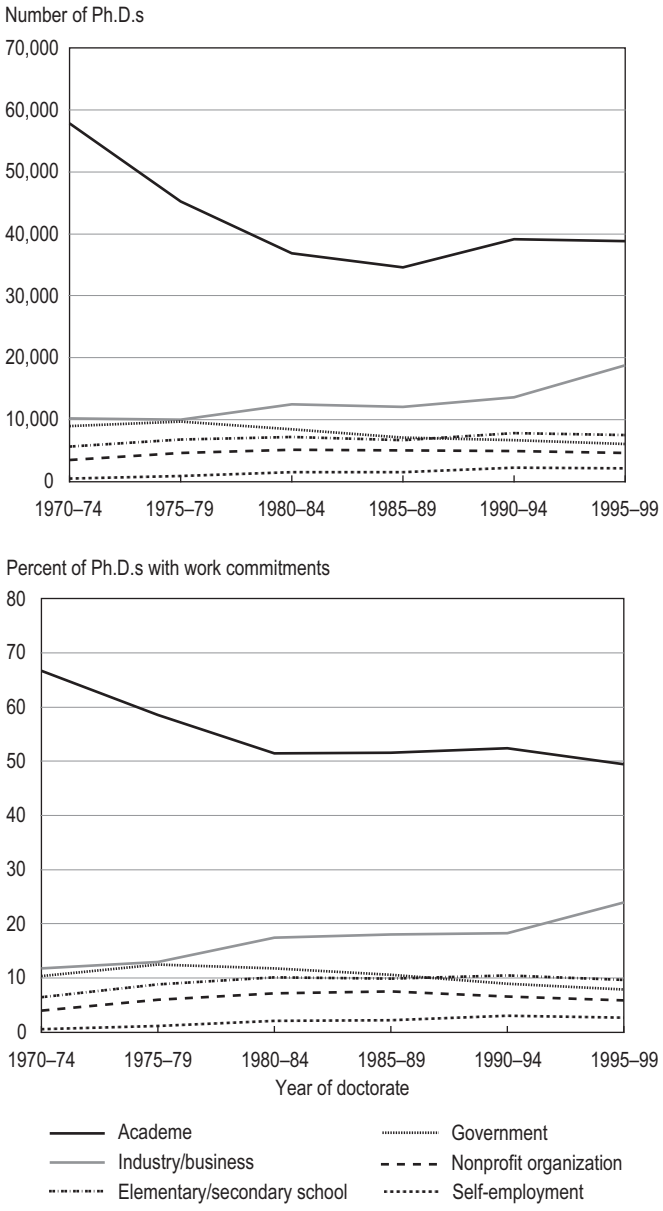
Employment Sectors

Earning a doctorate during the first 70 years of the 20th century typically assured the graduate of a position in academe. By the early 1970s, however, the academic labor market was becoming saturated with Ph.D. faculty. Moreover, growth in enrollments did not continue at the rates of the 1960s, when the entry of the baby boomers caused enrollments of undergraduate students to increase rapidly. Nearly 67 percent of new Ph.D.s who graduated with work commitments in 1970–74 were hired into academic positions. By the early 1980s, academic job commitments among new Ph.D.s had declined to about 50 percent, and the percentage remained close to this mark to the end of the century (46 percent in 4-year institutions and 4 percent in 2-year institutions in the 1995–99 period). The number of new Ph.D.s with academic positions also fell, from 57,802 in 1970–74 to 38,807 in 1995–99, although the numbers were higher in the 1990s than in the 1980s (figure 6-19).

The decrease in the proportion of new Ph.D.s with job commitments in academe was evident in all major fields (table 6-3). In 1995–99 about 37 percent of Ph.D.s with degrees in S&E fields and work commitments in the United States found jobs in academe, a substantial decrease from the almost 58 percent who did so in 1970–74. Compared with S&E Ph.D.s, percentages of non-S&E Ph.D.s who found work in academe were higher, although there was a decline for this group as well. About 63 percent of non-S&E Ph.D.s in the late 1990s had academic commitments, down from approximately 76 percent in the early 1970s.

Humanities Ph.D.s had the highest rate of academic employment—83 percent in 1995–99—but lower than the 94 percent level in 1970–74. Three-fourths of Ph.D.s in professional and other fields and two-thirds of Ph.D.s in social sciences also obtained academic positions in the late 1990s. Historically, engineering and physical science Ph.D.s have been the least likely to take jobs in academe after graduation. About 36 percent of physical scientists took academic jobs in the early 1970s; by the late 1990s, the figure was down to about 21 percent. Academic commitments were even less common among engineering Ph.D.s—27 percent in 1970–74 and 14 percent in 1995–99.

FIGURE 6-19. Employment sectors of Ph.D.s with U.S. postgraduation work commitments: 1970–99



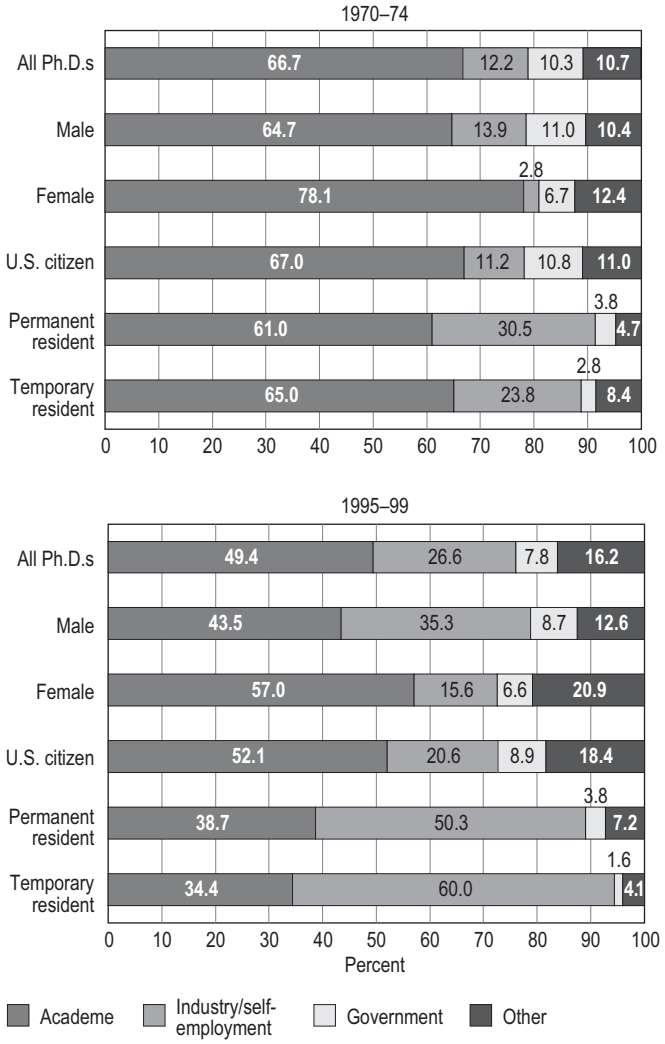
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

During the last 25 years of the century, there was a dramatic change in academic commitments among Ph.D.s in mathematics and computer sciences. (These two fields are combined for comparison of the 1970–74 and 1995–99 periods; computer sciences did not become a separate field on the SED until the late 1970s.) This combined field ranked fourth in academic job commitments among Ph.D.s graduating in 1970–74, about 80 percent of whom took jobs in academe. By 1995–99 only 47 percent of Ph.D.s in the combined field were hired into academe. This change reflects the growth of computer technology industries in the last decade of the 20th century.

Government was the only sector other than academe to show decreasing employment of new Ph.D.s, both in percentage and in number. A trend away from the academic and government sectors and toward employment commitments in industries and businesses (including self-employment) and "other" sectors (elementary and secondary schools, nonprofit organizations) characterized all demographic groups (figure 6-20). In 1995–99 female Ph.D.s (57 percent) were still more likely than male Ph.D.s (44 percent) to go into academe, but the level of academic commitments was about 21 percentage points lower for both groups than it was in 1970–74.

The relatively small differences in the proportions of academic appointments among the three citizenship groups in the early 1970s had widened by the late 1990s. In the period 1970–74 about two-thirds of U.S. citizens were hired into academe, with hires of temporary residents

FIGURE 6-20. Employment sectors of Ph.D.s with U.S. postgraduation work commitments, by sex and citizenship status: 1970–74 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 6-3. Employment sectors of Ph.D.s with U.S. postgraduation work commitments, by major field of doctorate: 1970–74 and 1995–99

(Percent)

Field	Academe	Industry and self-employment	Government	Other
1970–74				
All fields	66.7	12.2	10.3	10.7
Science and engineering	57.6	22.1	14.4	5.8
Agricultural sciences	56.9	23.5	17.7	1.9
Biological sciences	69.7	10.5	14.2	5.6
Earth, atmospheric, and ocean sciences	51.9	23.1	22.3	2.7
Mathematics and computer sciences	80.1	12.2	5.8	1.9
Physical sciences	36.3	43.5	16.0	4.2
Psychology	56.6	5.7	21.6	16.1
Social sciences	83.6	3.6	8.1	4.7
Engineering	26.9	51.8	17.4	3.8
Non-science and engineering	76.1	2.0	6.1	15.8
Education	64.0	1.5	8.7	25.8
Health	65.5	10.8	15.1	8.6
Humanities	93.5	0.8	1.4	4.3
Professional fields/other	82.9	6.1	6.2	4.8
1995–99				
All fields	49.4	26.6	7.8	16.2
Science and engineering	36.5	44.4	10.9	8.2
Agricultural sciences	37.5	41.8	15.8	4.8
Biological sciences	46.8	31.5	13.6	8.0
Earth, atmospheric, and ocean sciences	33.9	38.4	22.4	5.3
Mathematics and computer sciences	47.4	44.9	4.9	2.7
Physical sciences	21.1	67.9	7.6	3.4
Psychology	37.2	24.3	13.4	25.2
Social sciences	65.7	14.0	10.8	9.4
Engineering	14.3	72.7	10.6	2.4
Non-science and engineering	62.8	8.2	4.5	24.5
Education	48.0	6.5	5.4	40.1
Health sciences	59.3	17.5	11.1	12.1
Humanities	82.8	5.8	1.7	9.7
Professional fields/other	74.7	13.2	3.4	8.7

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

and permanent residents trailing by only 2 and 6 percentage points, respectively. In 1995–99 a slim majority of U.S.-citizen Ph.D.s obtained academic appointments, compared with about two-fifths of permanent residents and about one-third of temporary residents. The size of the disparity between U.S. citizens and foreign nationals is fairly recent. Academic commitment levels for the three citizenship groups remained relatively close—above 50 percent—into the mid-1990s. In fact, in the three 5-year periods from 1980 to 1994, the percentages of temporary residents going into academe were larger than those of other citizenship groups of new Ph.D.s.

The percentage of new Ph.D.s who reported having commitments to jobs in industries and businesses (including self-employment) immediately after graduation more than doubled, from about 12 to 27 percent, between the periods 1970–74 and 1995–99 (table 6-3, figure 6-20). The number of Ph.D.s hired by industry also increased, from 10,139 to 18,762. None of the other sectors accounted for more than one-tenth of Ph.D.s' job commitments in either period.

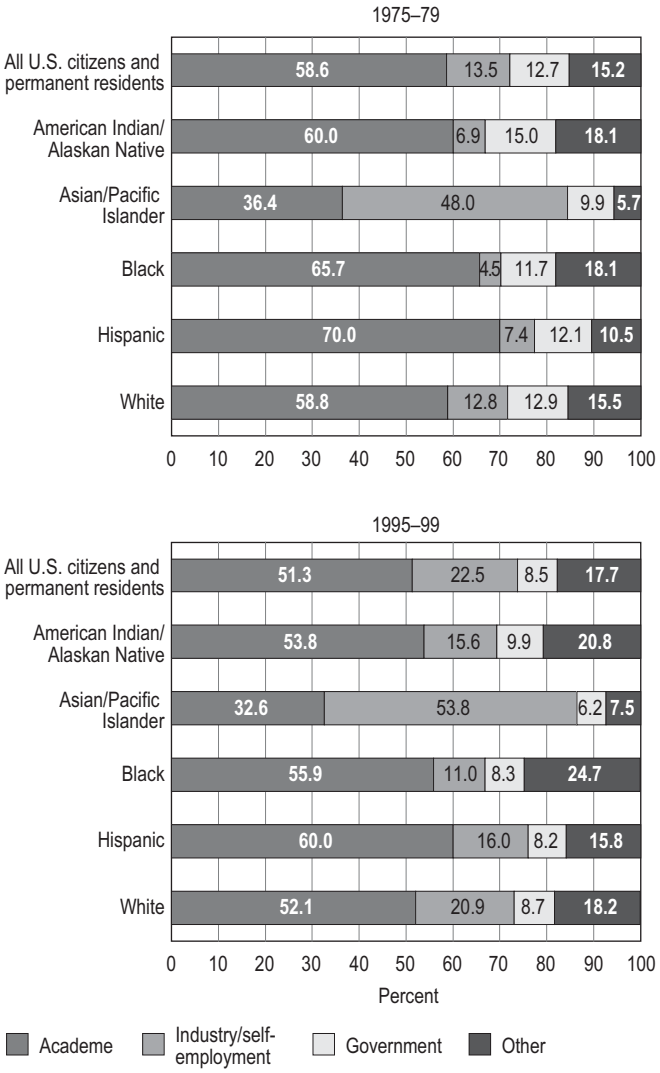
By 1995–99, industry (including self-employment) was the largest employer of S&E Ph.D.s overall (44 percent of those with U.S. work commitments) and of Ph.D.s in four S&E subfields: engineering (73 percent); physical sciences (68 percent); agricultural sciences (42 percent); and earth, atmospheric, and ocean sciences (38 percent). Although job commitments in academe were more numerous among Ph.D.s in other S&E fields, the role of industry is still noteworthy. Industry's share of Ph.D.s'

work commitments in these other fields ranged from 14 percent (social sciences) to 45 percent (the combined field of mathematics and computer sciences).

The mid-1990s brought a surge of industrial employment among both permanent and temporary residents. This sudden change may reflect the concentrations of non-U.S.-citizen Ph.D.s in engineering and computer sciences, fields that were particularly linked to the very large number of new technology jobs that were created during the 1990s. Although U.S.-citizen Ph.D.s were increasingly drawn into industry (including self-employment), job commitments in this sector were proportionally higher among non-U.S. citizens. In 1995–99 the share of postgraduation work commitments to industry was 50 percent among permanent residents and 60 percent among temporary residents, compared with 21 percent among U.S. citizens.

Decreasing academic employment and increasing employment in other sectors appeared as a pattern also among racial/ethnic groups of U.S. citizens and permanent residents (figure 6-21). The distribution across employment sectors for racial/ethnic groups reflects the different field concentrations of these groups. In both the 1970–74 and 1995–99 periods, S&E Ph.D.s were more likely than non-S&E Ph.D.s to obtain jobs in industry (table 6-3). Historically, Asians/Pacific Islanders and whites have had the greatest concentrations in S&E fields and also have had the largest percentages of new Ph.D.s with postgraduation commitments in industry. Black and American Indian/Alaskan Native Ph.D.s have been more concentrated in social sciences, education, and other non-S&E fields, which is reflected in their substantial percentages in the cluster of other sectors, namely elementary and secondary schools and nonprofit organizations.

FIGURE 6-21. Employment sectors of U.S. citizen and permanent resident Ph.D.s with U.S. postgraduation work commitments, by race/ethnicity: 1975–79 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Primary Work Activities

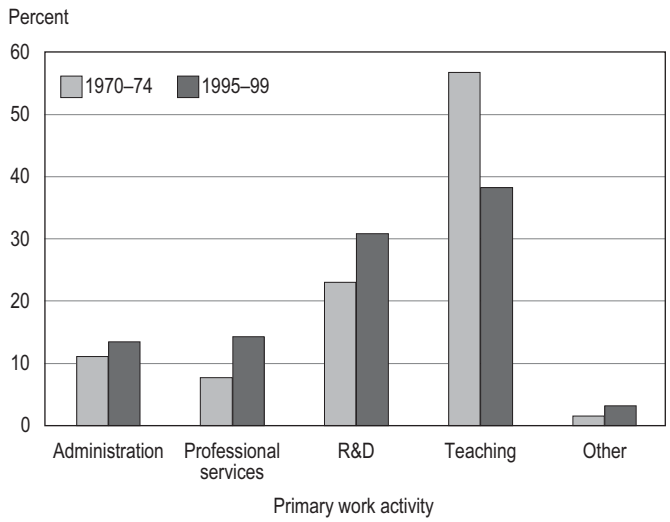
At the end of the 20th century, teaching was still the most common postgraduation work activity of Ph.D.s with job commitments in the United States, but the percentage was far smaller than it had been 30 years earlier (figure 6-22). Nearly 57 percent of new Ph.D.s with work commitments in 1970–74 intended to spend most of their time teaching, compared with about 38 percent in 1995–99. At the same time, research and development (R&D) increased as a primary work activity. In 1995–99, 31 percent of Ph.D.s with job commitments reported R&D as their primary work activity, up from 23 percent in 1970–74. This trend parallels the trend in academic and industrial employment. Teaching declined as commitments in academe fell, and R&D rose along with commitments in industry. In addition, Ph.D.s who graduated in 1995–99 were more likely to work in administration and professional services than Ph.D.s who graduated in 1970–74.

Interstate Migration after Graduation

Increasing proportions of Ph.D.s with definite work commitments had postgraduation employment commitments in the state where the doctorate was granted: 47 percent in 1995–99, up from 37 percent in 1970–74 (figure 6-23).[4] In 1970–74 education was the only doctoral field in which a majority of Ph.D.s remained to work

[4] In this section, "state" includes the District of Columbia and Puerto Rico.

FIGURE 6-22. Primary work activities of Ph.D.s with U.S. postgraduation work commitments: 1970–74 and 1995–99



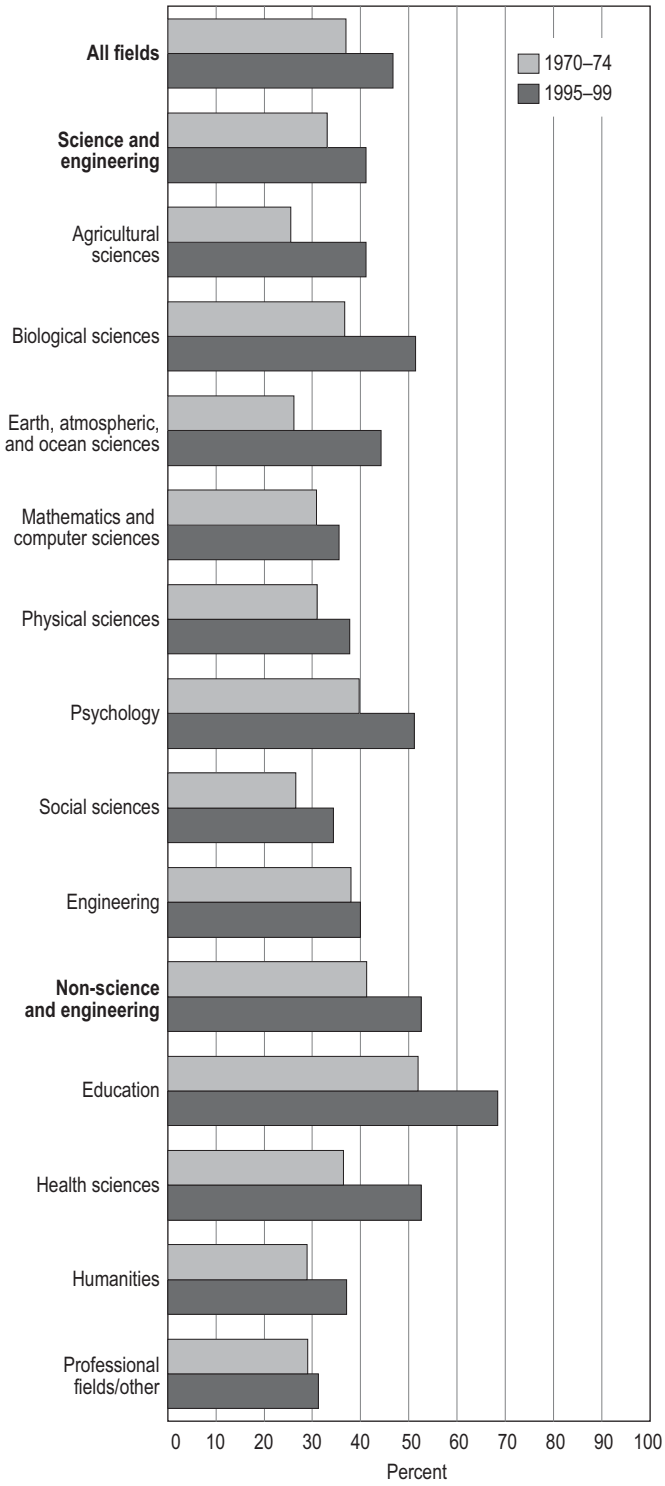
SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

in the state where they received their doctorates. In-state job commitments in the other major fields ranged from one-fourth of Ph.D.s in agricultural sciences to two-fifths of Ph.D.s in psychology. By 1995–99, however, a majority of Ph.D.s in four fields had work commitments in their doctoral state: a slim majority in the fields of psychology, biological sciences, and health sciences, and more than a two-thirds majority in education. Many of the graduates in these fields, especially in education, planned to continue in positions they held while studying for the doctorate.

States make substantial investments in their colleges and universities, so it benefits states to retain as many of their graduates as can be absorbed into the workforce. During the last three decades of the 20th century, in nearly all states, increasing percentages of Ph.D.s who had definite work commitments reported that they were remaining in the state where they received their doctorate (table 6-4). In 1995–99, 17 states retained 50 percent or more of their Ph.D. graduates, and 25 states retained 40 to 49 percent. In contrast, only Puerto Rico (93 percent) and California (55 percent) retained a majority of their doctoral graduates in the 1970–74 period.

Between 1970–74 and 1995–99, only in Puerto Rico, the District of Columbia, and Pennsylvania did the proportions of Ph.D.s who remained after earning a doctorate decline. Although the stay rate was higher for Puerto Rico than for any other state in both 1970–74 and 1995–99, the rate declined 17 percentage points between the two periods. Ph.D. retention in most other states increased dramatically. Rates of retention among

FIGURE 6-23. Ph.D.s with postgraduation work commitments in same state as doctoral institution, by major field of doctorate: 1970–74 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Ph.D.s with definite commitments about doubled between 1970–74 and 1995–99 in Idaho, Montana, Nevada, North Dakota, Rhode Island, and Vermont, and more than tripled in New Hampshire.

TABLE 6-4. Ph.D.s with postgraduation work commitments in same state as the doctoral institution, by state: 1970–74 and 1995–99

(Percent)

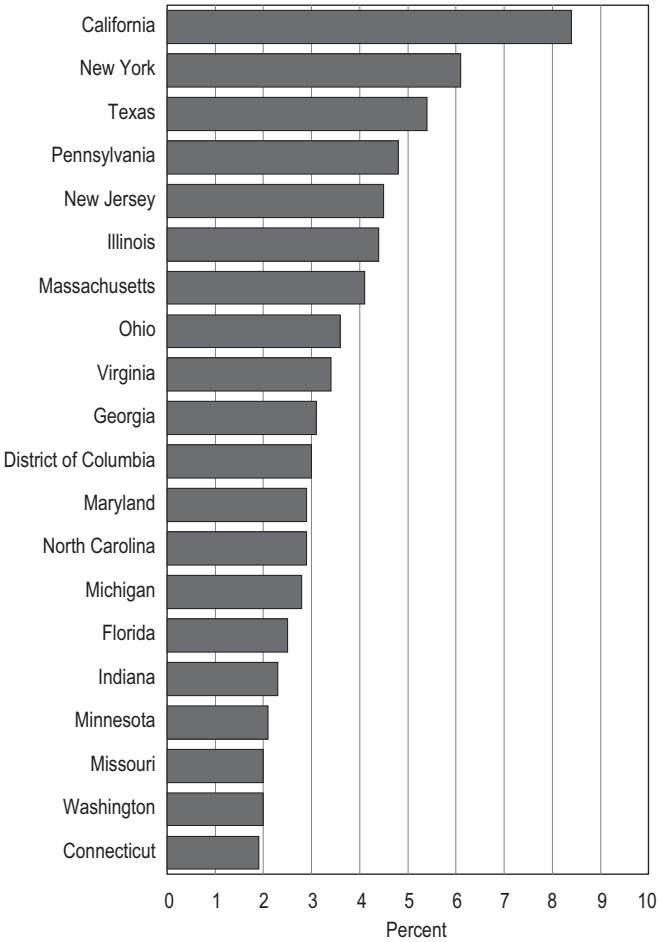
State	1970–74	1995–99	% change
All Ph.D.s	37.0	46.7	9.7
Alabama	45.8	48.4	2.6
Alaska	46.2	63.2	17.0
Arizona	32.8	42.7	9.9
Arkansas	27.7	50.4	22.7
California	55.5	61.2	5.7
Colorado	29.3	50.5	21.2
Connecticut	20.7	30.6	9.9
Delaware	24.4	32.8	8.4
District of Columbia	33.9	27.4	-6.5
Florida	36.6	41.2	4.6
Georgia	38.7	46.9	8.2
Hawaii	46.6	63.1	16.5
Idaho	27.6	55.4	27.8
Illinois	31.9	41.8	9.9
Indiana	18.7	26.3	7.6
Iowa	21.3	35.6	14.3
Kansas	23.0	43.6	20.6
Kentucky	33.1	45.1	12.0
Louisiana	33.1	47.2	14.1
Maine	35.5	62.5	27.0
Maryland	32.8	39.8	7.0
Massachusetts	38.4	44.2	5.8
Michigan	33.3	43.3	10.0
Minnesota	33.3	44.2	10.9
Mississippi	33.3	46.0	12.7
Missouri	33.5	49.4	15.9
Montana	28.9	56.2	27.3
Nebraska	37.1	52.2	15.1
Nevada	31.1	63.3	32.2
New Hampshire	9.0	31.1	22.1
New Jersey	36.0	42.1	6.1
New Mexico	32.9	48.0	15.1
New York	46.7	50.1	3.4
North Carolina	31.4	40.4	9.0
North Dakota	24.5	46.2	21.7
Ohio	40.1	46.9	6.8
Oklahoma	34.7	50.7	16.0
Oregon	26.0	46.9	20.9
Pennsylvania	45.3	43.8	-1.5
Rhode Island	12.5	23.1	10.6
South Carolina	37.8	48.6	10.8
South Dakota	28.3	47.4	19.1
Tennessee	36.7	51.5	14.8
Texas	49.2	58.6	9.4
Utah	34.7	50.7	16.0
Vermont	26.9	58.6	31.7
Virginia	40.6	46.1	5.5
Washington	30.0	46.3	16.3
West Virginia	36.2	49.0	12.8
Wisconsin	24.0	34.7	10.7
Wyoming	19.4	27.8	8.4
Puerto Rico	93.3	76.7	-16.6

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Another way of viewing Ph.D. migration is to consider states that are destinations of Ph.D.s who migrate. In the 1995–99 period the top four destinations of Ph.D.s with definite job commitments outside the state where the doctorate was received were the same as the top four destinations overall (that is, including Ph.D.s who stayed in their doctoral state) (figures 6-24, 6-26).

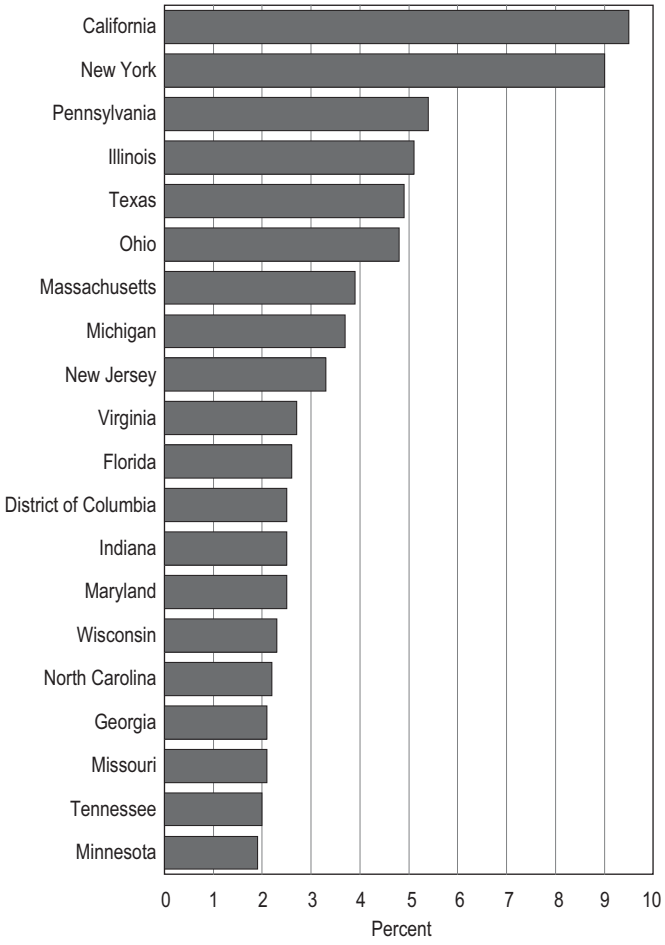
California and New York, which have long been the leading producers of Ph.D.s, also have long been the most popular destinations of Ph.D.s with job commitments (figures 6-25, 6-26). In both 1970–74 and 1995–99 nearly one-fifth of all Ph.D.s with U.S. work commitments reported job locations in California or New York. Some earned their degrees in those states; some intended to cross state lines to accept employment in those states. The 11 top destinations of Ph.D.s with work commitments were the same in 1970–74 and 1995–99, although with some differences in rank.

FIGURE 6-24. Top 20 destinations of Ph.D.s who left the state where the doctorate was received for postgraduation work commitments in another state: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

FIGURE 6-25. Top 20 destinations of Ph.D.s with U.S. postgraduation work commitments: 1970–74

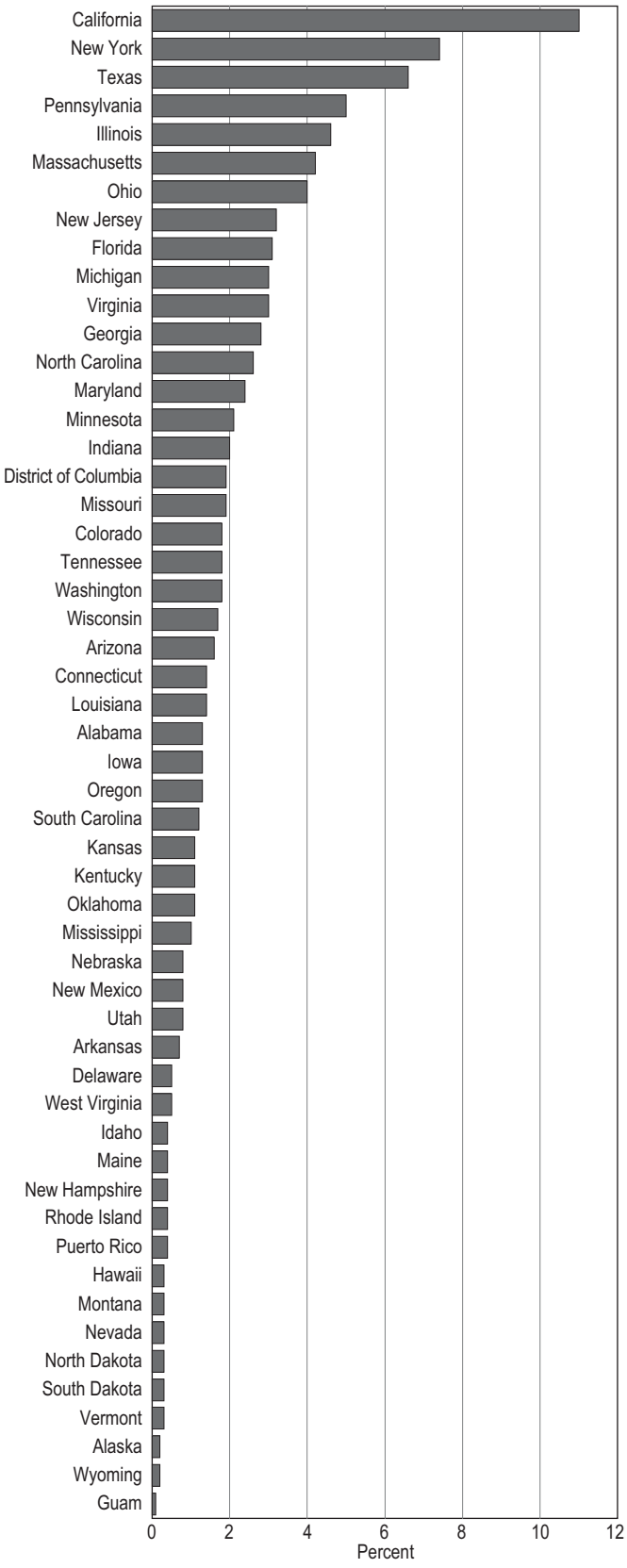


SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

The top destinations of Ph.D.s in each major doctoral field vary somewhat across states. In table 6-5 the overall ranking across all fields is given for each state that placed among the top five in one or more fields. These rankings include all Ph.D.s with work commitments in the United States—those who remained in the state where they earned their doctorate as well as those who left. The three states ranking highest as destinations of Ph.D.s —California, New York, and Texas—drew high percentages of Ph.D.s in most fields. Eleven other states ranked in the top five destinations for at least one major field.

Three key locations in a Ph.D.'s educational career are the states where the Ph.D.'s high school education took place, where the Ph.D.'s doctoral education took place, and where the Ph.D. is employed after graduation. Comparisons of these states for the two-thirds of Ph.D.s with U.S. work commitments provide a more complete picture of migration patterns than can be gleaned from comparisons that consider only the state where the doctorate

FIGURE 6-26. Destinations of Ph.D.s with U.S. postgraduation work commitments: 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE 6-5. Top 5 destinations of Ph.D.s with U.S. postgraduation work commitments, by major field of doctorate: 1995–99

Field	Employed [a]	Ranking (% of all Ph.D.s in field)													
		California	New York	Texas	Pennsylvania	Illinois	Massachusetts	Ohio	New Jersey	Virginia	Maryland	Minnesota	District of Columbia	Colorado	Washington
All fields	78,703	1 (11.0)	2 (7.4)	3 (6.6)	4 (5.0)	5 (4.6)	6 (4.2)	7 (4.0)	8 (3.2)	10 (3.0)	14 (2.4)	15 (2.1)	17 (1.9)	19 (1.8)	19 (1.8)
Science and engineering	40,162	1 (14.0)	2 (7.9)	3 (6.6)	5 (4.5)		4 (4.9)								
Agricultural sciences	1,174	2 (5.2)		4 (4.8)		3 (4.9)						1 (5.4)			5 (4.0)
Biological sciences	3,539	1 (12.8)	2 (6.8)	3 (5.5)	5 (5.2)		4 (5.4)								
Earth, atmospheric, and ocean sciences	1,059	2 (12.2)		1 (16.1)						5 (3.9)	3 (4.7)			4 (4.6)	
Mathematics and computer sciences	4,190	1 (15.8)	2 (9.1)	4 (5.3)	5 (5.2)				3 (5.4)						
Physical sciences	4,292	1 (15.2)	2 (7.3)	5 (5.4)			4 (5.8)		3 (6.8)						
Psychology	6,432	2 (10.2)	1 (11.0)	3 (6.4)	4 (5.0)	5 (4.5)									
Social sciences	8,094	3 (8.4)	1 (8.9)	5 (4.4)			4 (6.2)						2 (8.8)		
Engineering	11,382	1 (20.4)	3 (6.4)	2 (8.7)			5 (4.9)	5 (4.9)	4 (5.0)						
Non-science and engineering	38,541	1 (7.9)	2 (6.9)	3 (6.5)	4 (5.5)	5 (5.0)									
Education	18,726	1 (7.6)	4 (5.5)	2 (6.5)	3 (5.7)	5 (5.1)									
Health sciences	2,985	1 (9.0)	3 (5.5)	2 (6.5)	4 (5.2)	5 (4.8)									
Humanities	10,645	2 (8.7)	1 (9.1)	3 (5.9)	4 (5.4)	5 (4.7)									
Professional fields/ other	6,185	3 (6.9)	1 (8.4)	2 (7.9)	4 (5.3)	4 (5.3)									

[a] Number of employed Ph.D.s for whom state is known.

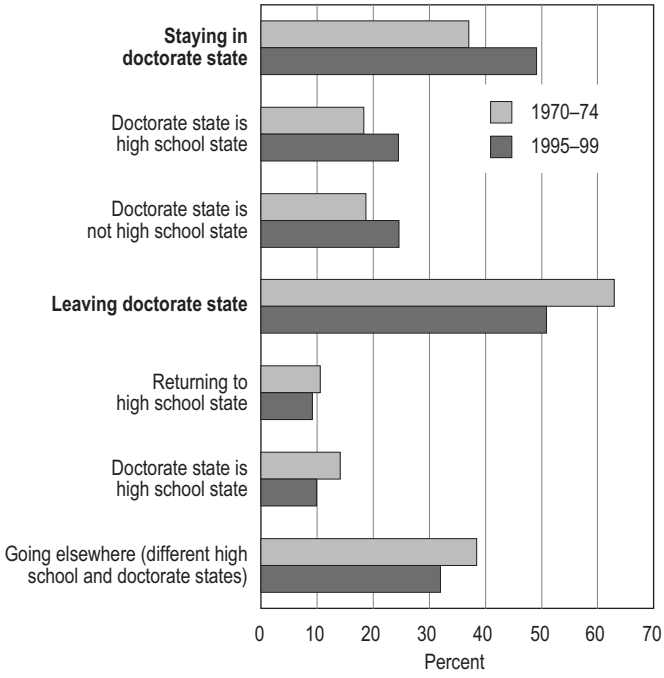
NOTE: Numbers in parentheses are percentages based on the total number of Ph.D.s with U.S. work commitments in each field.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

was received and the state where the Ph.D. is employed postgraduation (figure 6-27). Among Ph.D.s graduating in 1995–99, nearly half (49 percent) of U.S. citizens and permanent residents who received high school diplomas in the United States and who also reported postdoctoral work commitments in the United States planned to stay in the state where they received the doctorate, compared with 37 percent in 1970–74. About half of these individuals received their high school education in the same state. This means that about one-fourth of all U.S.-citizen and permanent resident Ph.D.s with U.S. work commitments in the 1995–99 period reported the same state for their high school, doctoral institution, and first postgraduation job. In the 1970–74 period, 18 percent of Ph.D.s reported the same state for these three milestones.

The expansion of doctoral education into every state during the 20th century could explain the increasing geographic stability among Ph.D.s. Many students no longer have to travel out of state to pursue a graduate education, including doctoral study, in their chosen field. Moreover, as state economies become more diverse, it is likely that new Ph.D.s find more job opportunities in the state where they were raised and where they received most, and perhaps all, of their education.

FIGURE 6-27. Employment destinations of U.S. citizen and permanent resident Ph.D.s with U.S. high school diplomas and U.S. postgraduation work commitments: 1970–74 and 1995–99



SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Appendix A. Detailed Doctoral Fields and Demographic Characteristics of Ph.D.s

Appendix A consists of two tables that provide detailed data on doctoral fields and three basic demographic characteristics of Ph.D.s—citizenship status, race/ethnicity, and sex.

Table A-1 displays the number of doctorates awarded in each of the field specialties that make up the major fields analyzed in this report. The field data are presented for each of the 5-year Ph.D. cohorts from 1960–64 to 1995–99, for the aggregate 1960–99 period (results of the Survey of Earned Doctorates), and for the entire 1920–99 period covered in the Doctorate Records File. Consistent data on field specialties became available in 1958, when the first Survey of Earned Doctorates was administered. The earlier data were obtained from public sources, such as commencement programs, so the fields tend to be broader.

Fields in table A-1 are grouped according to the classification scheme used by the National Science Foundation (NSF) in its reports. Science and engineering, as defined by NSF, includes the following major fields: agricultural sciences; biological sciences; earth, atmospheric, and ocean sciences; mathematics and computer sciences; physical sciences (astronomy, chemistry, physics, and miscellaneous related fields); psychology; social sciences; and engineering. The major fields in non-science and engineering, as defined by NSF, are education, health sciences, humanities, and professional fields/other. Other agencies and organizations often classify the fields differently. The most prominent difference between the NSF scheme and the schemes used by others is the treatment of health fields. These fields, considered to be non-S&E by NSF, are commonly grouped by other agencies with biological and agricultural sciences under the "life sciences" rubric, or with biological sciences under the "biomedical sciences" rubric.

Table A-2 displays the number of Ph.D.s within demographic groups defined by the various combinations of citizenship status, race/ethnicity, and sex—for example, U.S. black women. Valid data on race/ethnicity became available in 1975. The data in this table are shown for the 5-year Ph.D. cohorts from 1975–79 to 1995–99 and also for the aggregate period 1975–99. See appendix C for technical notes pertaining to citizenship status, race/ethnicity, and sex.

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
All fields	1,354,873	1,206,369	58,699	103,372	161,208	159,728	156,105	163,396	193,326	210,535
Science and engineering	835,221	740,221	38,267	66,183	94,862	90,804	91,690	100,930	123,214	134,271
Science	688,345	601,617	32,296	53,061	77,858	77,388	78,343	81,946	96,148	104,577
Biological and agricultural sciences	206,635	180,479	9,404	15,542	21,983	21,899	23,977	24,850	29,428	33,396
Agricultural sciences	39,456	34,343	2,305	3,165	4,236	4,183	4,857	5,184	5,356	5,057
Agronomy/crop science	7,417	5,708	712	854	816	678	773	741	630	504
Animal breeding/genetics	371	371	0	0	0	0	53	126	98	94
Animal husbandry	2,690	1,738	574	650	338	110	66	0	0	0
Animal nutrition	2,267	2,267	0	1	317	563	528	346	262	250
Animal sciences nec	1,432	1,432	0	0	0	0	182	443	439	368
Conservation/renewable natural resources	201	201	0	0	0	0	0	19	78	104
Dairy science	162	162	0	0	0	0	0	28	75	59
Fish/wildlife science	1,119	1,000	98	128	259	311	204	0	0	0
Fisheries science/management	657	657	0	0	0	0	81	175	193	208
Food distribution	1	1	0	0	0	0	0	0	1	0
Food engineering	123	123	0	0	0	0	0	17	61	45
Food sciences	1,935	1,935	0	39	388	533	570	405	0	0
Food sciences nec	1,730	1,730	0	0	0	0	0	266	722	742
Forest biology	253	253	0	0	0	0	0	43	111	99
Forest engineering	33	33	0	0	0	0	0	4	9	20
Forest management	232	232	0	0	0	0	0	39	86	107
Forestry and related sciences nec	670	670	0	0	0	0	0	92	283	295
Forestry science	2,339	2,003	164	302	386	406	437	308	0	0
General agricultural sciences	339	220	9	36	20	36	21	30	31	37
Horticulture science	3,451	2,641	249	340	323	322	384	342	371	310
Plant breeding/genetics	1,234	1,234	0	0	0	0	149	383	387	315
Plant pathology	4,095	3,322	389	482	501	442	480	359	330	339
Plant protection/pest management	13	13	0	0	0	0	0	7	6	0
Plant sciences nec	404	404	0	0	0	0	36	101	121	146
Poultry science	161	161	0	0	0	0	0	21	89	51
Soil chemistry/microbiology	327	327	0	0	0	0	0	61	122	144
Soil sciences	1,549	1,549	0	40	375	406	436	292	0	0
Soil sciences nec	844	844	0	0	0	0	0	137	360	347
Wildlife/range management	630	630	0	0	0	0	0	88	278	264
Wildlife science	146	146	0	0	0	0	62	84	0	0
Wood science and pulp/paper technology	237	237	0	0	0	0	0	23	99	115
Other agricultural sciences	2,394	2,099	110	293	513	376	395	204	114	94
Biological sciences	167,179	146,136	7,099	12,377	17,747	17,716	19,120	19,666	24,072	28,339
Anatomy	4,438	3,778	233	446	686	663	676	481	364	229
Bacteriology	221	221	0	0	0	0	22	60	71	68
Biochemistry	27,689	24,141	1,491	2,485	3,060	3,056	3,220	3,011	3,808	4,010
Biological immunology	1,440	1,440	0	0	0	0	0	0	330	1,110
Biomedical sciences	752	752	0	0	0	0	0	0	0	752
Biometrics/biostatistics	1,766	1,724	64	113	182	224	243	200	315	383
Biophysics	4,209	4,004	157	445	559	619	476	411	554	783
Biotechnology research	74	74	0	0	0	0	0	0	22	52
Botany nec	8,518	5,401	573	811	961	784	679	576	538	479
Cell biology	3,103	3,103	0	0	0	0	241	608	950	1,304
Cytology	802	798	66	178	226	196	132	0	0	0
Developmental biology/embryology	1,337	1,328	48	169	164	88	76	47	226	510
Ecology	5,979	5,875	184	293	647	788	925	857	913	1,268
Endocrinology	389	389	0	0	0	0	58	95	126	110
Entomology	7,184	5,752	483	740	950	776	771	738	661	633
General biological sciences	7,206	6,825	36	194	807	931	972	1,119	1,519	1,247
Genetics	3,884	2,974	422	638	717	707	490	0	0	0
Genetics, human/animal	2,591	2,591	0	0	0	0	177	539	830	1,045
Genetics, plant	495	495	0	0	0	0	39	121	158	177
Hydrobiology	292	250	34	61	107	48	0	0	0	0
Immunology	2,589	2,589	0	0	137	493	711	737	511	0

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Microbiology	6,230	6,230	0	0	0	0	655	1,589	1,940	2,046
Microbiology/bacteriology	10,155	7,348	963	1,638	1,968	1,735	1,044	0	0	0
Molecular biology	10,305	10,305	0	91	618	747	1,093	1,655	2,601	3,500
Neuroscience	4,397	4,397	0	0	0	0	396	773	1,228	2,000
Nutritional science	3,349	2,833	27	0	0	364	529	631	637	645
Parasitology	498	498	0	0	45	88	93	102	89	81
Pathology	1,599	1,428	108	216	358	435	311	0	0	0
Pathology, human/animal	1,886	1,886	0	0	0	0	185	545	595	561
Pathology, plant	567	567	0	0	0	0	59	151	200	157
Pharmacology, human/animal	8,787	8,016	337	621	849	1,003	1,272	1,208	1,322	1,404
Physiology, animal/plant	2,349	307	307	0	0	0	0	0	0	0
Physiology, human/animal	10,261	10,244	399	1,229	1,719	1,567	1,459	1,230	1,376	1,265
Physiology, plant	2,514	2,454	158	396	430	272	313	293	302	290
Toxicology	1,911	1,911	0	0	0	0	157	537	502	715
Zoology nec	12,126	8,052	922	1,320	1,643	1,263	973	740	612	579
Other biological sciences	5,287	5,156	87	293	914	869	673	612	772	936
Earth, atmospheric, and ocean sciences	27,066	23,886	1,380	2,124	2,871	3,218	3,100	3,178	3,942	4,073
Atmospheric sciences	3,195	3,027	107	203	307	375	408	435	539	653
Atmospheric dynamics	514	514	0	0	0	93	110	95	114	102
Atmospheric physics/chemistry	536	536	0	0	0	69	83	95	114	175
General atmospheric sciences/meteorology	385	385	0	0	0	0	21	61	135	168
Meteorology	1,306	1,139	107	203	307	68	45	129	145	135
Other atmospheric sciences/meteorology	454	453	0	0	0	145	149	55	31	73
Earth sciences	18,719	15,767	1,212	1,714	2,068	2,008	1,899	1,986	2,528	2,352
Applied geology	389	389	0	27	138	99	88	30	7	0
Applied geology/geological engineering	277	233	110	123	0	0	0	0	0	0
General geological and related sciences	3,083	915	27	94	181	191	156	68	112	86
Geochemistry	1,508	1,508	0	41	218	263	241	201	291	253
Geology	3,147	3,121	64	131	100	116	301	652	915	842
Geomorphology/glacial geology	664	631	47	68	109	119	68	61	73	86
Geophysics, solid earth	971	799	126	190	358	125	0	0	0	0
Geophysics, seismology	2,078	2,078	0	0	0	254	367	426	523	508
Hydrology/water resources	768	767	14	51	108	107	110	99	113	165
Mineralogy/petrology	1,026	1,026	0	50	254	218	170	124	121	89
Mineralogy/petrology/geological chemistry	929	755	376	379	0	0	0	0	0	0
Paleontology	1,181	1,128	132	207	192	177	116	101	108	95
Stratigraphy/sedimentation	1,727	1,564	296	276	277	208	170	113	132	92
Other geological and related sciences	971	853	20	77	133	131	112	111	133	136
Ocean sciences	3,554	3,494	61	207	366	545	551	525	604	635
Marine sciences	641	641	0	0	0	68	139	138	159	137
Oceanography	2,913	2,853	61	207	366	477	412	387	445	498
Other environmental sciences	1,598	1,598	0	0	130	290	242	232	271	433
Mathematics and computer sciences	52,466	48,252	2,082	4,325	6,188	5,052	4,842	6,051	9,410	10,302
Mathematics	39,806	35,592	2,082	4,325	6,187	4,690	3,591	3,765	5,253	5,699
Algebra	3,692	3,594	270	679	825	505	314	262	342	397
Analysis/functional analysis	5,723	5,445	556	1,060	1,198	703	441	429	539	519
Applied mathematics	5,645	5,440	258	573	643	538	561	682	985	1,200
Computing theory	1,883	1,883	48	207	850	495	65	63	77	78
General mathematics	5,363	4,439	61	215	531	468	408	658	1,125	973
Geometry	1,487	1,416	86	129	180	122	167	194	232	306
Logic	931	915	53	130	159	134	105	103	118	113
Mathematical statistics	6,074	5,882	367	527	638	831	811	753	1,013	942
Number theory	1,078	1,058	83	98	150	120	126	102	160	219
Operations research	775	775	0	0	27	219	160	124	130	115
Topology	2,858	2,737	259	531	622	353	243	174	257	298
Other mathematics	4,297	2,008	41	176	364	202	190	221	275	539
Computer sciences	12,660	12,660	0	0	1	362	1,251	2,286	4,157	4,603
Computer science	11,416	11,416	0	0	1	362	1,190	1,949	3,781	4,133
Information science/systems	1,244	1,244	0	0	0	0	61	337	376	470

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Physical sciences	152,857	123,314	9,525	14,897	18,075	13,943	13,507	15,903	18,607	18,857
Astronomy	4,899	4,513	134	404	617	654	545	552	676	931
Astronomy	1,846	1,846	0	36	291	323	246	256	299	395
Astronomy/astrophysics	821	435	134	301	0	0	0	0	0	0
Astrophysics	2,232	2,232	0	67	326	331	299	296	377	536
Chemistry	93,746	72,551	6,005	8,581	10,120	8,081	8,353	9,699	10,902	10,810
Agricultural/food chemistry	994	639	188	240	164	47	0	0	0	0
Analytical chemistry	8,806	8,445	420	623	756	853	1,096	1,446	1,521	1,730
General chemistry	11,066	7,864	107	198	659	746	885	1,421	2,251	1,597
Inorganic chemistry	9,325	8,905	561	1,014	1,352	1,049	1,051	1,257	1,269	1,352
Medicinal/pharmaceutical chemistry	2,853	2,580	203	267	287	265	293	320	401	544
Nuclear chemistry	730	730	135	137	147	97	77	51	52	34
Organic chemistry	25,209	22,480	2,496	3,490	3,627	2,504	2,525	2,558	2,564	2,716
Physical chemistry	16,236	14,447	1,716	2,264	2,378	1,723	1,521	1,527	1,757	1,561
Polymer chemistry	2,083	2,083	0	0	49	261	298	411	499	565
Theoretical chemistry	1,757	1,756	102	192	300	228	197	231	264	242
Other chemistry	14,687	2,622	77	156	401	308	410	477	324	469
Physics	53,838	45,876	3,386	5,912	7,338	5,208	4,590	5,528	6,901	7,013
Acoustics	618	588	47	47	90	60	82	73	99	90
Chemical and atomic/molecular physics	4,182	3,984	402	627	670	521	379	358	483	544
Electromagnetism	412	347	106	126	68	47	0	0	0	0
Electron physics	24	24	0	0	0	0	3	18	3	0
Elementary particle physics	6,553	6,422	535	1,026	1,099	650	629	769	844	870
Fluids	813	811	89	188	118	83	68	74	79	112
General physics	8,910	7,199	136	462	864	866	816	1,176	1,550	1,329
Mechanics	116	100	23	40	30	7	0	0	0	0
Nuclear physics	5,041	4,703	686	900	999	500	351	418	397	452
Optics	2,004	1,989	37	66	143	193	242	302	455	551
Plasma/high-temperature physics	1,982	1,982	0	63	394	330	338	314	306	237
Polymer physics	312	312	0	0	0	0	18	64	103	127
Solid state/low-temperature physics	12,193	11,890	807	1,723	1,987	1,347	1,169	1,363	1,810	1,684
Theoretical physics	559	260	260	0	0	0	0	0	0	0
Thermal physics	257	257	31	92	84	38	12	0	0	0
Other physics	9,862	5,008	227	552	792	566	483	599	772	1,017
Other physical sciences	374	374	0	0	0	0	19	124	128	103
Psychology	112,623	103,463	4,351	6,618	11,370	14,770	16,219	15,699	16,593	17,843
Clinical psychology	38,240	36,983	1,536	2,138	3,367	4,759	5,969	5,922	6,609	6,683
Cognitive psychology/psycholinguistics	1,688	1,688	0	0	0	0	142	388	504	654
Comparative psychology	497	497	45	70	105	113	55	49	30	30
Counseling	12,061	11,878	287	392	811	1,360	1,894	2,349	2,455	2,330
Developmental/child psychology	6,046	5,795	107	252	644	1,003	1,026	883	865	1,015
Educational psychology	4,728	3,964	262	288	548	702	821	530	459	354
Experimental, comparative psychology/ physiology	3,076	457	450	7	0	0	0	0	0	0
Experimental psychology	8,751	8,734	532	1,384	1,802	1,638	1,208	739	721	710
Family/marriage counseling	279	279	0	0	0	0	0	0	0	279
General psychology	11,696	8,367	96	299	787	1,230	1,290	1,650	1,576	1,439
Human engineering	34	17	14	3	0	0	0	0	0	0
Human/individual and family development	804	804	0	0	0	0	0	0	129	675
Industrial/organizational psychology	3,835	3,694	188	248	354	378	432	541	702	851
Personality	1,319	1,304	121	164	258	270	185	108	91	107
Physiological psychology/psychobiology	3,332	3,328	113	404	607	617	467	368	324	428
Psychometrics	705	629	91	97	127	103	72	47	36	56
Quantitative psychology	249	249	0	0	0	0	31	75	65	78
School psychology	3,359	3,353	70	115	402	644	685	523	431	483
Social psychology	6,609	6,203	409	620	928	1,064	897	709	709	867
Other psychology	5,315	5,240	30	137	630	889	1,045	818	887	804
Social sciences	136,698	122,223	5,554	9,555	17,371	18,506	16,698	16,265	18,168	20,106
Economics	42,517	36,550	2,160	3,425	5,169	5,003	4,783	5,008	5,279	5,723
Agricultural economics	4,813	4,810	0	92	810	784	825	767	753	779

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Econometrics	1,056	968	76	131	137	131	111	130	125	127
Economics	36,648	30,772	2,084	3,202	4,222	4,088	3,847	4,111	4,401	4,817
Political science	31,311	27,847	1,397	2,438	4,185	4,247	3,468	3,306	4,032	4,774
International relations/affairs	4,047	3,612	276	436	621	505	415	407	475	477
Political science/government	12,347	12,347	0	0	1	2,368	2,225	2,046	2,505	3,202
Political science/public administration	10,503	7,474	1,121	2,002	3,563	788	0	0	0	0
Public administration	2,864	2,864	0	0	0	586	705	467	555	551
Public policy analysis	1,550	1,550	0	0	0	0	123	386	497	544
Sociology	22,284	19,490	925	1,613	2,975	3,381	2,858	2,367	2,536	2,835
Demography/population studies	371	371	0	0	0	0	45	107	110	109
Sociology	21,913	19,119	925	1,613	2,975	3,381	2,813	2,260	2,426	2,726
Other social sciences	40,586	38,336	1,072	2,079	5,042	5,875	5,589	5,584	6,321	6,774
American studies	2,118	2,118	0	0	0	410	407	376	434	491
Anthropology	12,508	11,735	370	645	1,421	1,981	1,780	1,736	1,711	2,091
Archaeology	1,069	899	38	62	85	135	136	132	160	151
Area studies	986	921	19	82	246	134	104	97	149	90
Criminology	810	810	0	0	0	0	191	166	194	259
General social sciences	973	911	25	40	136	164	122	137	145	142
Geography	5,729	4,922	292	403	882	784	581	585	633	762
History/philosophy of science and technology	860	860	0	0	137	145	113	114	145	206
Linguistics	6,777	6,484	246	492	848	867	873	918	1,095	1,145
Statistics	1,757	1,757	0	134	441	182	202	290	223	285
Urban affairs/studies	2,325	2,324	0	0	208	415	422	345	498	436
Social sciences nec	4,674	4,595	82	221	638	658	658	688	934	716
Engineering	146,876	138,604	5,971	13,122	17,004	13,416	13,347	18,984	27,066	29,694
Aerospace/aeronautical/astronautical engineering	6,260	5,962	252	696	898	562	489	712	1,091	1,262
Chemical engineering	20,604	18,791	1,127	1,865	2,097	1,657	1,767	3,016	3,536	3,726
Chemical engineering	18,862	17,049	1,127	1,842	2,017	1,538	1,597	2,692	3,043	3,193
Fuel technology/petroleum engineering	105	105	0	23	58	24	0	0	0	0
Petroleum engineering	831	831	0	0	22	95	118	127	225	244
Polymer/plastics engineering	806	806	0	0	0	0	52	197	268	289
Civil engineering	17,057	16,512	713	1,576	2,055	1,690	1,837	2,366	3,030	3,245
Civil engineering	14,757	14,292	598	1,326	1,733	1,345	1,540	2,172	2,719	2,859
Environmental health	2,300	2,220	115	250	322	345	297	194	311	386
Electrical engineering	36,603	35,202	1,566	3,312	3,999	3,242	2,990	4,448	7,380	8,265
Communications	477	477	0	0	0	0	36	128	141	172
Computer engineering	3,146	3,146	0	0	0	498	344	411	853	1,040
Electrical/electronics engineering	32,980	31,579	1,566	3,312	3,999	2,744	2,610	3,909	6,386	7,053
Industrial/manufacturing engineering	4,682	4,610	106	348	594	365	392	602	976	1,227
Materials/metallurgical engineering	13,897	12,816	583	1,177	1,482	1,255	1,301	1,754	2,488	2,776
Ceramic science	1,397	1,261	96	200	173	124	117	151	224	176
Materials science	7,105	7,105	0	22	423	624	728	1,122	1,882	2,304
Metallurgical engineering	5,395	4,450	487	955	886	507	456	481	382	296
Mechanical engineering	24,657	23,691	1,129	2,663	2,947	2,019	1,987	3,181	4,791	4,974
Engineering mechanics	5,251	5,076	446	1,055	1,000	557	431	511	616	460
Mechanical engineering	19,406	18,615	683	1,608	1,947	1,462	1,556	2,670	4,175	4,514
Other engineering	23,116	21,020	495	1,485	2,932	2,626	2,584	2,905	3,774	4,219
Agricultural engineering	2,422	2,331	101	182	311	235	312	358	443	389
Bioengineering/biomedical engineering	3,350	3,350	0	37	326	372	335	440	769	1,071
Engineering physics	1,472	1,403	232	548	177	90	70	63	102	121
Engineering science	689	689	0	0	0	0	58	146	231	254
General engineering	1,520	1,462	17	107	196	188	166	245	303	240
Mining/mineral engineering	535	535	0	10	55	26	57	115	150	122
Naval architecture/marine engineering	64	64	0	0	0	0	9	42	13	0
Nuclear engineering	3,327	3,327	0	120	595	530	586	468	534	494
Ocean engineering	365	365	0	0	0	0	23	104	112	126
Operations research	1,865	1,865	0	0	295	398	295	271	281	325
Systems engineering	1,352	1,352	0	0	0	357	287	211	244	253
Engineering nec	6,155	4,277	145	481	977	430	386	442	592	824

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Non-science and engineering	519,652	466,148	20,432	37,189	66,346	68,924	64,415	62,466	70,112	76,264
Education	256,014	233,488	9,609	17,945	33,856	37,119	36,316	32,479	33,038	33,126
Adult/continuing education	5,674	5,674	0	0	521	880	1,164	1,098	1,077	934
Agricultural education	1,455	1,454	150	176	189	139	211	185	236	168
Art education	1,611	1,609	63	134	273	266	262	219	189	203
Business education	1,979	1,967	106	288	453	361	260	222	134	143
Counseling education/counseling and guidance services	16,361	16,351	636	2,126	3,446	3,261	2,580	1,617	1,402	1,283
Curriculum/instruction	23,082	23,082	1	0	1,989	4,051	4,194	4,037	4,221	4,589
Educational administration/supervision	51,369	51,280	2,850	5,027	7,492	7,662	7,870	8,330	6,928	5,121
Educational assessment/testing/measurement	655	655	0	0	0	0	107	225	168	155
Educational evaluation and research, higher education	15,003	15,003	0	0	1,598	3,288	3,301	2,543	1,934	2,339
Educational/instructional media design	2,981	2,981	56	228	528	448	399	391	397	534
Educational leadership	7,932	7,932	0	0	0	0	0	2	2,755	5,175
Educational measurement/statistics	1,709	1,707	60	270	564	540	273	0	0	0
Educational statistics/research methods	1,148	1,148	0	0	0	0	191	315	332	310
Elementary education	6,163	6,159	607	1,131	1,509	1,024	699	513	392	284
English education	2,416	2,414	87	221	441	407	355	327	280	296
Foreign languages education	1,243	1,243	12	53	162	165	146	190	229	286
General education	34,977	12,851	1,778	299	1,278	1,941	1,911	1,789	2,301	1,554
Health education	1,465	1,465	0	0	0	0	192	447	451	375
Home economics education	833	833	46	105	177	151	136	91	68	59
Junior high school education	4	4	0	0	0	0	1	3	0	0
Mathematics education	3,084	3,082	82	413	651	444	312	336	343	501
Music education	3,469	3,458	171	373	598	467	493	457	439	460
Nursing education	500	500	0	0	0	0	127	160	114	99
Physical education/coaching	2,816	2,816	0	0	0	0	454	982	843	537
Physical education/health and recreation	6,339	6,193	546	1,039	1,854	1,670	1,084	0	0	0
Pre-elementary/early childhood education	1,439	1,439	0	0	0	0	359	371	413	296
Psychology, educational	13,152	13,085	451	1,291	2,310	2,304	1,882	1,662	1,593	1,592
Psychology, school	1,640	1,640	0	0	0	0	198	472	448	522
Reading education	2,730	2,730	0	0	1	539	817	510	497	366
Science education	3,981	3,972	377	606	893	533	444	331	375	413
Secondary education	4,722	4,710	684	860	1,120	799	557	339	181	170
Social/philosophical foundations of education	6,858	6,854	312	1,188	1,430	1,197	930	605	545	647
Social science education	1,329	1,324	92	184	348	266	191	99	68	76
Special education	9,566	9,563	220	892	1,386	1,551	1,666	1,307	1,229	1,312
Speech education	166	166	0	0	0	91	46	23	6	0
Teacher education nec	2,342	2,336	104	241	687	372	181	229	237	285
Technical education	288	288	0	0	0	0	0	41	126	121
Technical/industrial arts education	1,255	1,252	65	226	357	207	139	85	77	96
Trade/industrial education	3,144	3,141	35	162	584	959	888	350	94	69
Other education	9,134	9,127	18	412	1,017	1,136	1,296	1,576	1,916	1,756
Health sciences	28,098	26,493	527	989	2,384	2,556	3,290	4,155	5,602	6,990
Dentistry	24	8	6	2	0	0	0	0	0	0
Environmental health	1,090	1,090	0	0	51	144	201	186	209	299
Epidemiology	2,037	2,037	0	0	0	0	179	446	613	799
Exercise physiology/science, kinesiology	648	648	0	0	0	0	0	0	87	561
General health sciences	712	712	7	20	89	84	88	100	173	151
Health systems/service administration	401	401	0	0	0	0	0	0	88	313
Hospital administration	95	90	14	17	43	16	0	0	0	0
Medicine science/surgery	662	164	56	62	31	15	0	0	0	0
Nursing	5,372	5,372	0	0	0	117	565	1,172	1,633	1,885
Optometry/ophthalmology	35	17	8	9	0	0	0	0	0	0
Pharmacy	3,669	3,355	141	224	307	322	403	549	685	724
Public health	2,150	2,150	0	0	0	1	115	552	707	775
Public health/epidemiology	2,369	1,848	134	281	436	554	443	0	0	0
Rehabilitation/therapeutic services	262	262	0	0	0	0	0	0	121	141
Speech/language pathology, audiology	3,494	3,494	1	64	727	694	609	472	458	469
Veterinary medicine	1,720	1,634	97	184	195	154	214	219	306	265
Health sciences nec	3,358	3,211	63	126	505	455	473	459	522	608

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Humanities	171,870	145,508	8,676	15,029	23,495	21,304	16,691	15,957	19,757	24,599
Art, applied	43	43	0	2	33	8	0	0	0	0
Art, fine/applied	865	430	213	217	0	0	0	0	0	0
Art history/criticism/conservation	4,465	4,465	0	76	510	754	731	685	754	955
Classics	3,965	2,719	280	419	466	355	277	257	316	349
Comparative literature	3,369	3,369	0	0	0	567	614	597	726	865
Drama/theater arts	2,192	2,192	0	0	0	284	500	433	485	490
General humanities	1,071	755	11	34	99	116	102	117	140	136
History, American	9,837	9,837	0	339	2,271	1,778	1,248	986	1,318	1,897
History, Asian	289	289	0	0	0	0	0	0	0	289
History, European	6,686	6,686	0	258	1,754	1,339	838	619	796	1,082
History, general	13,122	6,462	2,024	2,771	0	0	134	450	590	493
History, other	6,599	6,597	0	244	1,581	1,658	1,029	664	677	744
Language/literature, Arabic	134	134	0	0	0	0	16	42	37	39
Language/literature, Chinese	309	309	0	0	0	0	29	61	101	118
Language/literature, English	13,665	13,665	0	797	5,342	4,389	2,118	211	252	556
Language/literature, French	5,664	5,662	196	666	1,213	1,070	677	498	613	729
Language/literature, German	3,869	3,867	150	519	836	701	418	367	417	459
Language/literature, Hebrew	191	191	0	0	0	0	24	55	70	42
Language/literature, Italian	696	696	12	42	107	106	82	84	128	135
Language/literature, Japanese	175	175	0	0	0	0	17	50	51	57
Language/literature, Russian	1,209	1,209	21	118	256	261	141	101	138	173
Language/literature, Slavic (other than Russian)	183	183	0	0	0	0	21	35	59	68
Language/literature, Spanish	6,309	6,307	145	599	1,078	1,024	811	671	916	1,063
Language/literature nec	7,036	2,934	506	337	501	510	361	222	212	285
Letters, general	332	332	0	0	0	0	17	86	94	135
Letters nec	772	772	0	0	0	0	51	205	196	320
Literature, American	7,458	7,458	0	150	1,153	1,125	871	987	1,362	1,810
Literature, English	9,105	9,105	0	0	0	0	1,001	2,355	2,828	2,921
Literature, English/American	11,782	5,389	2,242	3,147	0	0	0	0	0	0
Music	16,309	15,588	518	689	1,301	1,925	2,008	2,447	3,098	3,602
Philosophy	13,364	11,141	685	1,159	1,898	1,655	1,239	1,211	1,383	1,911
Religion	5,770	5,770	0	0	338	928	849	977	1,146	1,532
Religion/theology	5,339	2,720	779	1,068	873	0	0	0	0	0
Speech/rhetorical studies	6,777	5,268	848	1,228	1,177	383	229	177	475	751
Humanities nec	2,919	2,789	46	150	708	368	238	307	379	593
Professional fields/other	63,670	60,659	1,620	3,226	6,611	7,945	8,118	9,875	11,715	11,549
Accounting	2,822	2,822	0	0	0	0	327	828	886	781
Agricultural business/management	16	16	0	0	0	0	0	2	4	10
Architectural/environmental design	871	841	8	18	0	0	59	170	289	297
Banking/financial support services	2,188	2,188	0	0	0	0	217	685	782	504
Business administration/management	4,667	4,667	0	0	0	0	354	1,131	1,365	1,817
Business management/administrative services, general	1,148	1,148	0	0	0	0	84	312	479	273
Business management/administrative services nec	15,068	13,668	957	2,040	3,603	3,625	2,110	458	528	347
Business/managerial economics	539	539	0	0	0	0	55	128	134	222
Business statistics	71	71	0	0	0	0	15	41	15	0
Communication theory	383	383	0	0	0	0	0	0	158	225
Communications, general	1,275	1,275	0	0	0	0	128	415	369	363
Communications research	1,028	1,028	0	0	0	0	117	381	277	253
Communications nec	4,011	4,011	0	0	610	1,346	899	418	396	342
General professional fields	30	30	0	0	0	0	2	3	9	16
Home economics	2,340	2,148	145	227	219	355	459	358	249	136
International business	187	187	0	0	0	0	0	0	22	165
Journalism	740	654	69	162	130	92	90	83	28	0
Law	2,047	1,112	151	128	164	115	113	144	139	158
Library science	1,968	1,837	73	87	275	313	330	293	257	209
Management information systems/business data processing	868	868	0	0	0	0	0	0	394	474

TABLE A-1. Doctorates awarded, by detailed field: 1920–99 total, 1960–99 total, and 5-year cohorts from 1960

Field	1920–99	1960–99	1960–64	1965–69	1970–74	1975–79	1980–84	1985–89	1990–94	1995–99
Marketing management/research	2,227	2,227	0	0	0	0	199	573	726	729
Mass communications	1,096	1,096	0	0	0	0	0	0	426	670
Operations research	906	906	0	0	0	0	84	257	288	277
Organizational behavior	1,407	1,407	0	0	0	0	123	360	392	532
Parks/recreation/leisure/fitness	255	255	0	0	0	0	0	0	81	174
Radio/television	159	159	0	0	0	0	47	89	23	0
Social work	6,559	6,485	168	321	551	784	1,031	1,116	1,243	1,271
Theology/religious education	5,955	5,953	1	46	364	943	1,049	1,217	1,341	992
Professional fields nec	1,064	1,064	0	10	159	244	108	196	169	178
Other/unknown fields	1,775	1,614	48	187	536	128	118	217	246	134

NOTES: Totals for 1920–99 and 1960–99 are the same for fields in which doctorates were not awarded before 1960. Field taxonomy in the Survey of Earned Doctorates is revised periodically to incorporate new fields and to separate fields that were previously combined. Occasionally fields that produce very few doctorates are eliminated.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE A-2. Citizenship status, race/ethnicity, and sex of Ph.D.s, by field of doctorate: 1975–99 total and 5-year cohorts from 1975

Characteristic	1975–99	1975–79	1980–84	1985–89	1990–94	1995–99
All fields	883,090	159,728	156,105	163,396	193,326	210,535
U.S. citizen	640,434	131,319	123,163	116,137	130,085	139,730
American Indian/Alaskan Native	2,722	282	392	498	640	910
Male	1,520	207	250	261	339	463
Female	1,202	75	142	237	301	447
Asian/Pacific Islander	17,156	1,777	2,381	2,840	4,119	6,039
Male	10,815	1,315	1,561	1,907	2,582	3,450
Female	6,336	462	820	933	1,534	2,587
Black	26,574	5,301	4,978	4,153	5,094	7,048
Male	11,822	3,120	2,328	1,667	2,020	2,687
Female	14,752	2,181	2,650	2,486	3,074	4,361
Hispanic	16,651	2,061	2,496	2,927	3,949	5,218
Male	9,102	1,470	1,484	1,562	2,022	2,564
Female	7,548	591	1,012	1,365	1,927	2,653
White	559,930	115,575	108,807	103,570	114,586	117,392
Male	343,719	84,886	70,138	61,634	64,137	62,924
Female	216,204	30,689	38,669	41,936	50,445	54,465
Permanent resident	48,679	7,239	6,297	7,583	11,541	16,019
American Indian/Alaskan Native	5	1	1	0	2	1
Male	1	0	1	0	0	0
Female	4	1	0	0	2	1
Asian/Pacific Islander	25,476	3,267	2,864	2,962	6,045	10,338
Male	18,282	2,772	2,278	2,224	4,183	6,825
Female	7,181	495	586	738	1,857	3,505
Black	2,961	321	451	689	797	703
Male	2,437	287	377	592	662	519
Female	523	34	74	97	135	183
Hispanic	2,450	253	355	481	668	693
Male	1,520	188	239	304	403	386
Female	930	65	116	177	265	307
White	16,158	2,776	2,480	3,135	3,751	4,016
Male	10,554	2,023	1,697	2,111	2,360	2,363
Female	5,603	753	783	1,024	1,391	1,652
Temporary resident	160,560	17,521	21,118	28,959	46,696	46,266
American Indian/Alaskan Native	19	8	0	2	7	2
Male	15	8	0	2	4	1
Female	4	0	0	0	3	1
Asian/Pacific Islander	89,299	6,146	9,171	15,534	29,790	28,658
Male	72,330	5,299	7,908	13,105	24,065	21,953
Female	16,912	847	1,263	2,429	5,692	6,681
Black	7,751	1,142	1,861	1,576	1,606	1,566
Male	6,606	1,061	1,708	1,362	1,301	1,174
Female	1,142	81	153	214	303	391
Hispanic	9,321	1,041	1,655	1,782	2,270	2,573
Male	7,347	927	1,389	1,442	1,726	1,863
Female	1,972	114	266	340	543	709
White	45,137	6,920	7,256	8,076	11,001	11,884
Male	35,822	6,017	6,113	6,465	8,493	8,734
Female	9,305	903	1,143	1,611	2,505	3,143
Science and engineering	540,909	90,804	91,690	100,930	123,214	134,271
U.S. citizen	356,531	69,862	67,987	65,962	73,453	79,267
American Indian/Alaskan Native	1,235	105	155	243	275	457
Male	782	84	117	148	169	264
Female	453	21	38	95	106	193

TABLE A-2. Citizenship status, race/ethnicity, and sex of Ph.D.s, by field of doctorate: 1975–99 total and 5-year cohorts from 1975

Characteristic	1975–99	1975–79	1980–84	1985–89	1990–94	1995–99
Asian/Pacific Islander	12,987	1,281	1,723	2,172	3,186	4,625
Male	8,888	1,021	1,222	1,577	2,185	2,883
Female	4,096	260	501	595	999	1,741
Black	8,817	1,463	1,502	1,387	1,750	2,715
Male	4,648	970	813	715	877	1,273
Female	4,169	493	689	672	873	1,442
Hispanic	8,414	820	1,102	1,481	2,141	2,870
Male	5,150	662	750	892	1,260	1,586
Female	3,264	158	352	589	881	1,284
White	314,440	62,547	60,954	59,245	64,954	66,740
Male	216,935	50,074	44,222	40,167	41,549	40,923
Female	97,503	12,473	16,732	19,078	23,404	25,816
Permanent resident	36,037	5,327	4,450	5,268	8,527	12,465
American Indian/Alaskan Native	3	1	1	0	0	1
Male	1	0	1	0	0	0
Female	2	1	0	0	0	1
Asian/Pacific Islander	21,102	2,799	2,299	2,280	4,947	8,777
Male	15,689	2,424	1,895	1,797	3,548	6,025
Female	5,404	375	404	483	1,396	2,746
Black	1,662	173	246	373	465	405
Male	1,440	161	226	335	401	317
Female	222	12	20	38	64	88
Hispanic	1,480	143	212	296	423	406
Male	1,019	115	157	208	283	256
Female	461	28	55	88	140	150
White	10,614	1,752	1,591	2,092	2,494	2,685
Male	7,689	1,418	1,211	1,559	1,764	1,737
Female	2,924	334	380	533	730	947
Temporary resident	127,843	13,507	16,000	23,003	37,939	37,394
American Indian/Alaskan Native	12	4	0	2	4	2
Male	10	4	0	2	3	1
Female	2	0	0	0	1	1
Asian/Pacific Islander	74,639	5,163	7,587	12,915	25,041	23,933
Male	62,697	4,581	6,785	11,257	20,886	19,188
Female	11,901	582	802	1,658	4,129	4,730
Black	4,810	670	1,073	964	1,057	1,046
Male	4,261	643	1,016	866	897	839
Female	547	27	57	98	158	207
Hispanic	7,388	835	1,313	1,466	1,774	2,000
Male	6,148	778	1,162	1,234	1,435	1,539
Female	1,238	57	151	232	338	460
White	33,973	5,033	5,166	6,124	8,454	9,196
Male	28,408	4,549	4,570	5,187	6,962	7,140
Female	5,558	484	596	937	1,490	2,051
Non-science and engineering	342,181	68,924	64,415	62,466	70,112	76,264
U.S. citizen	283,903	61,457	55,176	50,175	56,632	60,463
American Indian/Alaskan Native	1,487	177	237	255	365	453
Male	738	123	133	113	170	199
Female	749	54	104	142	195	254
Asian/Pacific Islander	4,169	496	658	668	933	1,414
Male	1,927	294	339	330	397	567
Female	2,240	202	319	338	535	846
Black	17,757	3,838	3,476	2,766	3,344	4,333
Male	7,174	2,150	1,515	952	1,143	1,414
Female	10,583	1,688	1,961	1,814	2,201	2,919

TABLE A-2. Citizenship status, race/ethnicity, and sex of Ph.D.s, by field of doctorate: 1975–99 total and 5-year cohorts from 1975

Characteristic	1975–99	1975–79	1980–84	1985–89	1990–94	1995–99
Hispanic	8,237	1,241	1,394	1,446	1,808	2,348
Male	3,952	808	734	670	762	978
Female	4,284	433	660	776	1,046	1,369
White	245,490	53,028	47,853	44,325	49,632	50,652
Male	126,784	34,812	25,916	21,467	22,588	22,001
Female	118,701	18,216	21,937	22,858	27,041	28,649
Permanent resident	12,642	1,912	1,847	2,315	3,014	3,554
American Indian/Alaskan Native	2	0	0	0	2	0
Male	0	0	0	0	0	0
Female	2	0	0	0	2	0
Asian/Pacific Islander	4,374	468	565	682	1,098	1,561
Male	2,593	348	383	427	635	800
Female	1,777	120	182	255	461	759
Black	1,299	148	205	316	332	298
Male	997	126	151	257	261	202
Female	301	22	54	59	71	95
Hispanic	970	110	143	185	245	287
Male	501	73	82	96	120	130
Female	469	37	61	89	125	157
White	5,544	1,024	889	1,043	1,257	1,331
Male	2,865	605	486	552	596	626
Female	2,679	419	403	491	661	705
Temporary resident	32,717	4,014	5,118	5,956	8,757	8,872
American Indian/Alaskan Native	7	4	0	0	3	0
Male	5	4	0	0	1	0
Female	2	0	0	0	2	0
Asian/Pacific Islander	14,660	983	1,584	2,619	4,749	4,725
Male	9,633	718	1,123	1,848	3,179	2,765
Female	5,011	265	461	771	1,563	1,951
Black	2,941	472	788	612	549	520
Male	2,345	418	692	496	404	335
Female	595	54	96	116	145	184
Hispanic	1,933	206	342	316	496	573
Male	1,199	149	227	208	291	324
Female	734	57	115	108	205	249
White	11,164	1,887	2,090	1,952	2,547	2,688
Male	7,414	1,468	1,543	1,278	1,531	1,594
Female	3,747	419	547	674	1,015	1,092

NOTE: Detail does not sum to total because citizenship, sex, and/or race/ethnicity are unknown for some Ph.D.s.

SOURCES: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Appendix B. Top 50 Baccalaureate and Doctoral Institutions and Doctorate Production by State

Appendix B provides information on where recipients of U.S. doctorates received their baccalaureates and doctorates. Tables B-1 through B-10 list the 50 top baccalaureate institutions of Ph.D.s; tables B-13 through B-22 list their 50 top doctoral institutions (ranking is by number of degrees awarded). Foreign students who earned baccalaureates in the United States are included in the baccalaureate tables. Tables B-11 and B-12 show the total number of doctorates awarded in each of the 50 U.S. states, the District of Columbia, and Puerto Rico, in all fields combined and by broad field of doctorate.

The tables provide information for all Ph.D.s. and for several different groups of Ph.D.s—those with S&E doctorates, those with non-S&E doctorates, male and female Ph.D.s, and U.S. citizen Ph.D.s among the five racial/ethnic groups discussed in this report.

List of Tables

TABLE B-1. Top 50 U.S. baccalaureate institutions of Ph.D.s: 1920–24 and 1995–99

Baccalaureate institution (1920–24)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	3,801	All U.S. institutions	140,286
University of Chicago *	128	University of California Berkeley	2,330
University of Wisconsin Madison	123	University of Michigan Ann Arbor	1,562
Cornell University *	112	Cornell University *	1,545
Harvard University *	107	University of Illinois Urbana-Champaign	1,524
University of Michigan Ann Arbor	92	University of Wisconsin Madison	1,390
University of Illinois Urbana-Champaign	91	University of Texas Austin	1,328
University of California Berkeley	87	Pennsylvania State University University Park	1,274
Columbia University in City of New York *	77	Harvard University *	1,209
Yale University *	74	University of California Los Angeles	1,171
Indiana University Bloomington	65	University of Minnesota Twin Cities	1,105
University of Pennsylvania *	58	Massachusetts Institute of Technology *	1,053
Ohio State University Columbus	55	Ohio State University Columbus	1,038
University of Minnesota Twin Cities	55	Brigham Young University *	1,011
City University of New York City College	51	Michigan State University	1,004
Johns Hopkins University *	51	Yale University *	973
University of Missouri Columbia	47	Stanford University *	937
Brown University *	46	Texas A&M University College Station	902
Oberlin College *	45	University of California Davis	890
Princeton University *	44	University of Pennsylvania *	888
University of Kansas Lawrence	44	University of Florida	882
Stanford University *	42	Purdue University West Lafayette	866
University of Iowa	37	Indiana University Bloomington	829
University of Nebraska Lincoln	36	University of Washington Seattle	814
Catholic University of America *	35	Princeton University *	807
Vassar College *	34	University of Virginia Charlottesville	806
Dartmouth College *	30	Rutgers State University of New Jersey New Brunswick	794
Mount Holyoke College *	30	Brown University *	774
New York University *	27	University of Colorado Boulder	770
University of Washington Seattle	27	University of Maryland College Park	752
University of North Carolina Chapel Hill	26	University of North Carolina Chapel Hill	698
University of Texas Austin	26	Virginia Polytechnic Institute and State University	697
Northwestern University *	25	Duke University *	688
Massachusetts Institute of Technology *	24	University of Massachusetts Amherst	671
Wellesley College *	23	University of California San Diego	661
West Virginia University Charleston	23	Northwestern University *	651
Barnard College *	22	Iowa State University	644
Ohio Wesleyan University *	22	State University of New York at Buffalo	643
Syracuse University *	22	University of Chicago *	642
University of Virginia Charlottesville	22	University of Arizona	635
Amherst College *	21	University of Iowa	620
George Washington University *	21	University of California Santa Barbara	604
Wesleyan University (Connecticut) *	21	Oberlin College *	582
Goucher College *	20	University of California Santa Cruz	575
Smith College *	20	Boston University *	569
University of Rochester *	20	University of Missouri Columbia	547
Clark University *	18	Arizona State University Tempe	535
Boston University *	17	Florida State University	532
Bryn Mawr College *	17	Columbia University in City of New York *	531
University of Oregon	17	University of Tennessee Knoxville	523
Valparaiso University *	17	University of California Irvine	511
Top 50 as percentage of total	57.7	Top 50 as percentage of total	31.4

* Privately controlled.

NOTES: Institutions are ranked by the number of Ph.D.s who received a baccalaureate from the institution; see also chapter 5. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-2. Top 50 U.S. baccalaureate institutions of science and engineering Ph.D.s: 1920–99 and 1995–99

Baccalaureate institution (1920–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	617,194	All U.S. institutions	80,596
University of California Berkeley	13,316	University of California Berkeley	1,704
University of Illinois Urbana-Champaign	9,792	Cornell University *	1,223
Massachusetts Institute of Technology *	9,254	University of Illinois Urbana-Champaign	1,085
Cornell University *	9,136	University of Michigan Ann Arbor	1,070
University of Michigan Ann Arbor	9,038	Massachusetts Institute of Technology *	985
University of Wisconsin Madison	8,394	University of Wisconsin Madison	936
Harvard University *	7,065	Pennsylvania State University University Park	870
University of California Los Angeles	6,979	University of Texas Austin	828
Pennsylvania State University University Park	6,868	Harvard University *	799
University of Minnesota Twin Cities	6,751	University of California Los Angeles	756
City University of New York City College	6,535	University of Minnesota Twin Cities	739
University of Texas Austin	5,880	University of California Davis	722
Ohio State University Columbus	5,781	Texas A&M University College Station	680
Purdue University West Lafayette	5,682	Stanford University *	654
Michigan State University	5,239	Purdue University West Lafayette	653
University of Chicago *	5,178	Michigan State University	629
Rutgers State University of New Jersey New Brunswick	4,975	Ohio State University Columbus	618
Stanford University *	4,951	Brigham Young University *	582
University of Washington Seattle	4,932	Princeton University *	582
Iowa State University	4,491	University of Pennsylvania *	581
Yale University *	4,362	University of Washington Seattle	568
Columbia University in City of New York *	4,247	University of Florida	564
University of Pennsylvania *	4,099	Yale University *	561
City University of New York Brooklyn College	4,037	Rutgers State University of New Jersey New Brunswick	555
Princeton University *	3,964	Virginia Polytechnic Institute and State University	555
New York University *	3,806	University of California San Diego	547
University of Maryland College Park	3,796	University of Virginia Charlottesville	536
University of Colorado Boulder	3,563	University of Colorado Boulder	532
University of Florida	3,563	Brown University *	511
University of California Davis	3,560	Duke University *	492
California Institute of Technology *	3,396	University of Maryland College Park	490
Brown University *	3,353	Iowa State University	474
Brigham Young University *	3,352	University of Chicago *	463
Texas A&M University College Station	3,283	University of Massachusetts Amherst	435
Northwestern University *	3,248	University of California Santa Cruz	420
Rensselaer Polytechnic Institute *	3,247	Northwestern University *	410
University of Missouri Columbia	3,163	University of California Irvine	402
Indiana University Bloomington	2,989	University of California Santa Barbara	401
University of Massachusetts Amherst	2,983	California Institute of Technology *	394
Case Western Reserve University *	2,947	North Carolina State University Raleigh	389
University of Kansas Lawrence	2,928	University of Arizona	388
University of Utah	2,912	State University of New York at Buffalo	386
University of Rochester *	2,830	Indiana University Bloomington	378
Oberlin College *	2,793	University of North Carolina Chapel Hill	375
State University of New York at Buffalo	2,750	Rensselaer Polytechnic Institute *	366
Virginia Polytechnic Institute and State University	2,706	Washington University Saint Louis *	355
University of Nebraska Lincoln	2,694	Georgia Institute of Technology	350
Duke University *	2,682	Rice University *	342
Johns Hopkins University *	2,645	University of Iowa	336
University of Iowa	2,638	University of Notre Dame *	336
Top 50 as percentage of total	38.7	Top 50 as percentage of total	37.2

* Privately controlled.

NOTES: Institutions are ranked by the number of Ph.D.s in science and engineering who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-3. Top 50 U.S. baccalaureate institutions of non-science and engineering Ph.D.s: 1920–99 and 1995–99

Baccalaureate institution (1920–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	450,950	All U.S. institutions	59,690
University of California Berkeley	4,739	University of California Berkeley	626
University of Michigan Ann Arbor	4,402	University of Texas Austin	500
University of Wisconsin Madison	4,233	University of Michigan Ann Arbor	492
University of Illinois Urbana-Champaign	3,912	University of Wisconsin Madison	454
Ohio State University Columbus	3,781	Indiana University Bloomington	451
Harvard University *	3,707	University of Illinois Urbana-Champaign	439
University of California Los Angeles	3,703	Brigham Young University *	429
University of Minnesota Twin Cities	3,698	Ohio State University Columbus	420
University of Texas Austin	3,581	University of California Los Angeles	415
Indiana University Bloomington	3,294	Yale University *	412
City University of New York City College	3,090	Harvard University *	410
Michigan State University	3,004	Pennsylvania State University University Park	404
Columbia University in City of New York *	2,998	Michigan State University	375
New York University *	2,984	University of Minnesota Twin Cities	366
Yale University *	2,876	University of North Carolina Chapel Hill	323
Brigham Young University *	2,839	Cornell University *	322
Pennsylvania State University University Park	2,801	University of Florida	318
City University of New York Brooklyn College	2,680	Florida State University	315
Cornell University *	2,462	University of Pennsylvania *	307
Stanford University *	2,452	University of Iowa	284
University of Washington Seattle	2,433	Stanford University *	283
Wayne State University	2,298	Oberlin College *	277
Boston University *	2,278	University of Georgia	273
University of Pennsylvania *	2,264	University of Virginia Charlottesville	270
University of Iowa	2,255	University of Missouri Columbia	266
Florida State University	2,233	Arizona State University Tempe	263
Northwestern University *	2,227	Brown University *	263
University of Florida	2,217	University of Maryland College Park	262
University of Chicago *	2,206	Baylor University *	257
University of North Carolina Chapel Hill	2,146	State University of New York at Buffalo	257
University of Missouri Columbia	2,124	Boston University *	250
Oberlin College *	2,082	University of Arizona	247
Rutgers State University of New Jersey New Brunswick	2,067	University of Washington Seattle	246
City University of New York Hunter College	1,975	University of Puerto Rico Rio Piedras	243
University of Maryland College Park	1,975	Northwestern University *	241
University of Nebraska Lincoln	1,961	Rutgers State University of New Jersey New Brunswick	239
University of Pittsburgh Pittsburgh	1,944	University of Colorado Boulder	238
University of Utah	1,922	University of Massachusetts Amherst	236
Princeton University *	1,903	Columbia University in City of New York *	231
University of Kansas Lawrence	1,881	University of Tennessee Knoxville	230
Temple University	1,873	San Diego State University	229
Southern Illinois University Carbondale	1,858	Southern Illinois University Carbondale	228
State University of New York at Buffalo	1,820	Princeton University *	225
University of Colorado Boulder	1,770	Texas A&M University College Station	222
Baylor University *	1,740	University of Nebraska Lincoln	221
City University of New York Queens College	1,711	Purdue University West Lafayette	213
University of North Texas	1,695	Illinois State University Normal	212
University of Georgia	1,657	University of Kansas Lawrence	208
Syracuse University *	1,635	New York University *	204
University of Alabama Tuscaloosa	1,596	University of California Santa Barbara	203
Top 50 as percentage of total	28.2	Top 50 as percentage of total	25.6

* Privately controlled.

NOTES: Institutions are ranked by the number of non–science and engineering Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-4. Top 50 U.S. baccalaureate institutions of male Ph.D.s: 1920–99 and 1995–99

Baccalaureate institution (1920–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	757,823	All U.S. institutions	75,103
University of California Berkeley	13,458	University of California Berkeley	1,387
University of Illinois Urbana-Champaign	10,720	University of Illinois Urbana-Champaign	945
Harvard University *	9,642	Cornell University *	908
University of Wisconsin Madison	9,448	University of Michigan Ann Arbor	848
University of Michigan Ann Arbor	9,388	University of Wisconsin Madison	815
Massachusetts Institute of Technology *	8,917	Pennsylvania State University University Park	810
Cornell University *	8,442	Massachusetts Institute of Technology *	805
City University of New York City College	8,317	Brigham Young University *	772
University of Minnesota Twin Cities	7,871	University of Texas Austin	740
Pennsylvania State University University Park	7,451	Harvard University *	727
University of California Los Angeles	7,443	University of Minnesota Twin Cities	657
Ohio State University Columbus	6,948	Texas A&M University College Station	579
University of Texas Austin	6,632	University of California Los Angeles	579
Columbia University in City of New York *	6,147	Purdue University West Lafayette	565
Yale University *	6,147	Ohio State University Columbus	549
Michigan State University	5,918	Yale University *	548
Purdue University West Lafayette	5,894	Michigan State University	545
University of Chicago *	5,594	Stanford University *	543
University of Washington Seattle	5,501	Princeton University *	523
Brigham Young University *	5,399	University of California Davis	510
Stanford University *	5,298	University of Pennsylvania *	503
Princeton University *	5,091	University of Florida	492
Rutgers State University of New Jersey New Brunswick	5,070	Virginia Polytechnic Institute and State University	477
New York University *	4,759	University of Washington Seattle	474
City University of New York Brooklyn College	4,589	University of Virginia Charlottesville	440
Iowa State University	4,538	University of Colorado Boulder	432
University of Pennsylvania *	4,285	Rutgers State University of New Jersey New Brunswick	429
University of Florida	4,208	University of Maryland College Park	416
Indiana University Bloomington	4,173	Iowa State University	413
University of Maryland College Park	3,979	University of Chicago *	400
University of Missouri Columbia	3,961	Indiana University Bloomington	399
University of Utah	3,928	University of California San Diego	397
Northwestern University *	3,748	Brown University *	392
University of Colorado Boulder	3,712	University of Massachusetts Amherst	377
University of Nebraska Lincoln	3,508	State University of New York at Buffalo	374
Texas A&M University College Station	3,484	Columbia University in City of New York *	368
University of Kansas Lawrence	3,484	University of North Carolina Chapel Hill	356
University of North Carolina Chapel Hill	3,440	Duke University *	347
University of Iowa	3,433	University of California Santa Barbara	345
University of Notre Dame *	3,364	Northwestern University *	344
Oberlin College *	3,312	University of Arizona	340
California Institute of Technology *	3,288	University of California Santa Cruz	334
Brown University *	3,248	University of Notre Dame *	332
Rensselaer Polytechnic Institute *	3,219	California Institute of Technology *	328
University of Massachusetts Amherst	3,160	North Carolina State University Raleigh	324
State University of New York at Buffalo	3,144	University of Iowa	320
Dartmouth College *	3,133	Rensselaer Polytechnic Institute *	319
Case Western Reserve University *	3,024	Georgia Institute of Technology	313
Oklahoma State University Stillwater	3,014	University of Tennessee Knoxville	306
University of Rochester *	2,953	University of Nebraska Lincoln	288
Top 50 as percentage of total	35.5	Top 50 as percentage of total	34.3

* Privately controlled.

NOTES: Institutions are ranked by the number of male Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-5. Top 50 U.S. baccalaureate institutions of female Ph.D.s: 1920–99 and 1995–99

Baccalaureate institution (1920–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	310,193	All U.S. institutions	65,106
University of California Berkeley	4,593	University of California Berkeley	940
University of Michigan Ann Arbor	4,052	University of Michigan Ann Arbor	714
University of California Los Angeles	3,238	Cornell University *	636
University of Wisconsin Madison	3,179	University of California Los Angeles	591
Cornell University *	3,155	University of Texas Austin	588
University of Illinois Urbana-Champaign	2,984	University of Illinois Urbana-Champaign	579
University of Texas Austin	2,829	University of Wisconsin Madison	575
City University of New York Hunter College	2,619	Ohio State University Columbus	487
Ohio State University Columbus	2,611	Harvard University *	480
University of Minnesota Twin Cities	2,577	Pennsylvania State University University Park	464
Barnard College *	2,364	Michigan State University	459
Michigan State University	2,322	University of Minnesota Twin Cities	447
Wellesley College *	2,301	Indiana University Bloomington	429
Pennsylvania State University University Park	2,217	Yale University *	424
Smith College *	2,177	Stanford University *	393
City University of New York Brooklyn College	2,127	University of Florida	389
Indiana University Bloomington	2,109	University of Pennsylvania *	384
Stanford University *	2,104	Brown University *	382
University of Pennsylvania *	2,075	University of California Davis	379
New York University *	2,031	University of Virginia Charlottesville	366
Rutgers State University of New Jersey New Brunswick	1,970	Rutgers State University of New Jersey New Brunswick	364
University of Washington Seattle	1,862	University of North Carolina Chapel Hill	342
Boston University *	1,854	Duke University *	341
University of Maryland College Park	1,792	University of Washington Seattle	339
University of Chicago *	1,789	University of Colorado Boulder	337
Mount Holyoke College *	1,743	University of Maryland College Park	336
Northwestern University *	1,727	University of Puerto Rico Rio Piedras	323
University of Colorado Boulder	1,620	Texas A&M University College Station	322
Florida State University	1,611	Smith College *	309
University of Florida	1,570	Northwestern University *	307
Oberlin College *	1,563	University of Iowa	300
City University of New York Queens College	1,553	Oberlin College *	299
Vassar College *	1,544	Purdue University West Lafayette	299
Radcliffe College *	1,505	University of Arizona	295
University of Pittsburgh Pittsburgh	1,494	Wellesley College *	295
Brown University *	1,476	University of Massachusetts Amherst	294
Duke University *	1,468	Boston University *	285
University of Iowa	1,459	Princeton University *	283
Bryn Mawr College *	1,458	Florida State University	277
State University of New York at Buffalo	1,426	University of Missouri Columbia	271
Purdue University West Lafayette	1,363	State University of New York at Buffalo	269
University of North Carolina Chapel Hill	1,331	University of California San Diego	264
Wayne State University	1,331	Arizona State University Tempe	259
University of Missouri Columbia	1,326	University of California Santa Barbara	258
University of Kansas Lawrence	1,324	New York University *	252
City University of New York City College	1,308	Massachusetts Institute of Technology *	246
University of Rochester *	1,306	College of William and Mary	242
University of Massachusetts Amherst	1,285	University of Chicago *	242
University of California Davis	1,260	University of California Santa Cruz	240
Syracuse University *	1,227	Brigham Young University *	239
Top 50 as percentage of total	32.0	Top 50 as percentage of total	28.9

* Privately controlled.

NOTES: Institutions are ranked by the number of female Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-6. Top 50 U.S. baccalaureate institutions of American Indian/Alaskan Native, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Baccalaureate institutution (1975–99)	Ph.D.s
All U.S. institutions	2,635
Oklahoma State University Stillwater	62
University of Oklahoma Norman	58
Northeastern State University (Oklahoma)	50
University of California Berkeley	40
University of North Carolina Pembroke	33
University of Wisconsin Madison	25
University of California Los Angeles	24
University of Washington Seattle	24
University of California Davis	23
University of New Mexico Albuquerque	23
University of Texas Austin	23
University of Arizona	22
Michigan State University	21
University of Central Oklahoma	21
Northern Arizona University	20
University of Montana Missoula	19
University of Arkansas Fayetteville	18
Auburn University Auburn	17
Arizona State University Tempe	16
Brigham Young University *	16
University of California Santa Barbara	16
University of Florida	16
University of Michigan Ann Arbor	16
California State University Long Beach	15
Cornell University *	15
University of South Dakota	15
Texas A&M University College Station	14
Ohio State University Columbus	13
Purdue University West Lafayette	13
Southeastern Oklahoma State University	13
University of North Dakota Grand Forks	13
California State University Fresno	12
California State University Fullerton	12
California State University Sacramento	12
Indiana University Bloomington	12
Oklahoma Baptist University *	12
San Diego State University	12
University of Colorado Boulder	12
Southwest Missouri State University Springfield	11
Texas Tech University	11
University of Maryland College Park	11
University of North Carolina Chapel Hill	11
University of South Florida	11
Top 57 as percentage of total[a]	37.8

Baccalaureate institutution (1995–99)	Ph.D.s
All U.S. institutions	842
University of Oklahoma Norman	20
University of California Berkeley	18
Northeastern State University (Oklahoma)	17
Oklahoma State University Stillwater	17
Auburn University Auburn	10
Northern Arizona University	9
University of Texas Austin	9
Michigan State University	8
University of Florida	8
University of North Carolina Pembroke	8
California State University Fresno	7
San Jose State University	7
Southeastern Oklahoma State University	7
Southwest Missouri State University Springfield	7
University of California Davis	7
University of Wisconsin Madison	7
Portland State University	6
Purdue University West Lafayette	6
San Diego State University	6
University of Arizona	6
University of California Los Angeles	6
University of Central Oklahoma	6
University of New Mexico Albuquerque	6
University of North Carolina Chapel Hill	6
University of Washington Seattle	6
Arizona State University Tempe	5
Cornell University *	5
New Mexico State University Las Cruces	5
Texas A&M University College Station	5
University of California Irvine	5
University of Michigan Ann Arbor	5
University of Missouri Columbia	5
University of North Dakota Grand Forks	5
University of Oregon	5
University of South Florida	5
Bemidji State University	4
Brigham Young University *	4
Indiana University Bloomington	4
Iowa State University	4
Jacksonville State University (Alabama)	4
Massachusetts Institute of Technology *	4
Miami University Oxford (Ohio)	4
Tufts University *	4
University of Alaska Fairbanks	4
University of Arkansas Fayetteville	4
University of Massachusetts Amherst	4
University of Montana Missoula	4
University of Pennsylvania	4
University of Tennessee Knoxville	4
Top 49 as percentage of total[b]	38.7

* Privately controlled.

[a] Because 14 institutions tied for 44th place (each with a count of 10), 57 institutions are included in percentage of total.

[b] Because 14 institutions tied for 36th place and 34 institutions tied for 50th place (each with a count of 3), the list contains only 49 institutions.

NOTES: Institutions are ranked by the number of U.S. American Indian/Alaskan Native Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-7. Top 50 U.S. baccalaureate institutions of Asian/Pacific Islander, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Baccalaureate institution (1975–99)	Ph.D.s
All U.S. institutions	12,475
University of California Berkeley	1,126
University of Hawaii Manoa	611
University of California Los Angeles	524
Massachusetts Institute of Technology *	387
Harvard University *	290
Stanford University *	260
University of California Davis	260
Cornell University *	256
University of Michigan Ann Arbor	202
University of Illinois Urbana-Champaign	200
University of Washington Seattle	193
California Institute of Technology *	189
University of California Irvine	162
Yale University *	159
University of California San Diego	148
Princeton University *	137
University of Maryland College Park	127
University of Southern California *	127
Columbia University in City of New York *	119
University of Chicago *	118
University of Pennsylvania *	116
Johns Hopkins University *	105
Northwestern University *	102
San Francisco State University	99
University of California Santa Barbara	99
University of Wisconsin Madison	98
University of Texas Austin	88
Rutgers State University of New Jersey New Brunswick	85
California State University Los Angeles	84
Purdue University West Lafayette	82
San Jose State University	79
University of Minnesota Twin Cities	78
Brown University *	72
Pomona College *	68
Harvey Mudd College *	64
State University of New York at Stony Brook	61
University of Utah	59
University of Colorado Boulder	58
New York University *	57
California State University Long Beach	56
Washington University Saint Louis *	56
City University of New York City College	54
State University of New York at Buffalo	54
University of Illinois Chicago	52
University of Rochester *	52
University of California Santa Cruz	51
Wellesley College *	50
Barnard College *	49
Pennsylvania State University University Park	49
Rice University *	47
Top 50 as percentage of total	61.9

Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	4,657
University of California Berkeley	448
Massachusetts Institute of Technology *	151
Harvard University *	146
University of California Los Angeles	146
Cornell University *	111
University of Hawaii Manoa	105
Stanford University *	93
University of California Davis	92
University of Michigan Ann Arbor	90
University of California Irvine	78
California Institute of Technology *	75
Princeton University *	72
University of Illinois Urbana-Champaign	72
University of California San Diego	67
Yale University *	66
University of Pennsylvania *	64
University of Washington Seattle	59
Johns Hopkins University *	50
University of Chicago *	49
University of Maryland College Park	43
University of Texas Austin	43
Northwestern University *	41
University of Southern California *	41
Brown University *	37
Columbia University in City of New York *	37
University of Wisconsin Madison	34
Purdue University West Lafayette	31
University of Minnesota Twin Cities	31
University of Virginia Charlottesville	31
Rutgers State University of New Jersey New Brunswick	30
Washington University Saint Louis *	30
University of California Santa Barbara	28
University of Rochester *	28
San Francisco State University	26
Carnegie Mellon University *	25
University of Colorado Boulder	24
California State University Los Angeles	23
University of Florida	23
Pennsylvania State University University Park	22
Rice University *	22
Texas A&M University College Station	22
California State University Long Beach	21
Pomona College *	21
San Jose State University	21
Wellesley College *	21
Duke University *	20
State University of New York at Buffalo	20
State University of New York at Stony Brook	20
Georgia Institute of Technology	19
Harvey Mudd College *	19
New York University *	19
Rensselaer Polytechnic Institute *	19
Top 52 as percentage of total[a]	62.8

* Privately controlled.

[a]Because four institutions tied for 49th place, 52 institutions are listed and are included in percentage of total.

NOTES: Institutions are ranked by the number of U.S. Asian/Pacific Islander Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-8. Top 50 U.S. baccalaureate institutions of black, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Baccalaureate institution (1975–99)	Ph.D.s
All U.S. institutions	25,872
Howard University *,†	752
Southern University A&M College Baton Rouge †	419
Hampton University *,†	386
Florida A&M University †	382
Tuskegee University *,†	361
North Carolina A&T State University †	337
Spelman College *,†	336
Morgan State University †	324
Wayne State University	323
Tennessee State University †	320
North Carolina Central University †	307
Jackson State University †	295
Fisk University *,†	278
Virginia State University †	256
Morehouse College *,†	231
South Carolina State University †	227
City University of New York City College	194
Grambling State University †	190
Alabama State University †	186
California State University Los Angeles	184
Chicago State University	183
University of the District of Columbia †	181
Prairie View A&M University †	178
University of Michigan Ann Arbor	171
Michigan State University	170
Ohio State University Columbus	164
Temple University	163
Alabama A&M University †	160
Clark Atlanta University *,†	160
Alcorn State University †	159
Tougaloo College *,†	158
City University of New York Hunter College	157
University of California Berkeley	157
University of Arkansas Pine Bluff †	156
Xavier University of Louisiana *,†	155
Texas Southern University †	152
Central State University (Ohio) †	144
Southern Illinois University Carbondale	144
Cheyney University of Pennsylvania †	143
University of California Los Angeles	142
University of Maryland College Park	138
Fort Valley State University †	137
Dillard University *,†	131
New York University *	131
Lincoln University (Pennsylvania) †	122
University of Illinois Urbana-Champaign	122
Norfolk State University †	114
Harvard University *	113
Virginia Union University *,†	112
Rutgers State University of New Jersey New Brunswick	109
Top 50 as percentage of total	41.4

Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	6,631
Howard University *,†	174
Spelman College *,†	100
Hampton University *,†	82
Florida A&M University †	78
Jackson State University †	71
Southern University A&M College Baton Rouge †	71
Wayne State University	69
North Carolina A&T State University †	67
Tuskegee University *,†	62
Morgan State University †	59
Chicago State University	55
North Carolina Central University †	54
Grambling State University †	50
Tennessee State University †	50
Morehouse College *,†	46
University of Michigan Ann Arbor	46
Temple University	44
University of Maryland College Park	44
University of California Berkeley	43
City University of New York City College	42
North Carolina State University Raleigh	42
University of Virginia Charlottesville	42
Brown University *	41
Northwestern University *	41
Michigan State University	40
Fisk University *,†	39
University of California Los Angeles	39
Prairie View A&M University †	38
Ohio State University Columbus	37
University of Illinois Urbana-Champaign	36
Norfolk State University †	35
South Carolina State University †	35
Harvard University *	34
Rutgers State University of New Jersey New Brunswick	34
Yale University *	34
Stanford University *	33
Texas Southern University †	33
Alabama A&M University †	32
University of North Carolina Chapel Hill	32
Xavier University of Louisiana *,†	32
California State University Los Angeles	31
Clark Atlanta University *,†	31
Dillard University *,†	31
City University of New York Hunter College	30
Florida State University	30
Southern Illinois University Carbondale	30
Tougaloo College *,†	30
Massachusetts Institute of Technology *	29
University of South Carolina Columbia	29
Alabama State University †	28
Top 50 as percentage of total	35.2

* Privately controlled.

† Historically black college or university.

NOTES: Institutions are ranked by the number of U.S. black Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-9. Top 50 U.S. baccalaureate institutions of Hispanic, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Baccalaureate institution (1975–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	15,574	All U.S. institutions	4,745
University of Puerto Rico Rio Piedras	1,835	University of Puerto Rico Rio Piedras	478
University of Puerto Rico Mayaguez	440	University of Puerto Rico Mayaguez	182
University of Texas Austin	333	University of Texas Austin	115
University of California Berkeley	289	University of California Berkeley	110
University of California Los Angeles	252	University of California Los Angeles	90
University of New Mexico Albuquerque	237	Florida International University	75
University of Miami *	226	University of Miami *	64
University of Texas El Paso	226	University of Florida	63
University of Florida	182	University of New Mexico Albuquerque	61
California State University Los Angeles	178	University of Texas El Paso	60
University of Arizona	170	Stanford University *	51
Texas A&M University Kingsville	145	Texas A&M University College Station	47
University of Texas Pan American	144	University of Arizona	47
University of California Santa Barbara	142	Cornell University *	46
Florida International University	137	University of California Davis	42
City University of New York City College	136	San Diego State University	41
Pontifical Catholic University of Puerto Rico Ponce *	136	University of California Santa Barbara	41
San Diego State University	120	Massachusetts Institute of Technology *	40
New York University *	114	University of California Irvine	39
New Mexico State University Las Cruces	113	New Mexico State University Las Cruces	38
Inter American University Puerto Rico San German *	112	California State University Los Angeles	35
Stanford University *	112	Arizona State University Tempe	33
City University of New York Hunter College	109	University of Michigan Ann Arbor	32
Texas A&M University College Station	108	Rutgers State University of New Jersey New Brunswick	30
Cornell University *	105	Yale University *	30
California State University Long Beach	104	Pontifical Catholic University of Puerto Rico Ponce *	29
San Jose State University	103	University of Texas Pan American	29
University of California Irvine	100	California State University Northridge	28
Arizona State University Tempe	98	Harvard University *	28
Rutgers State University of New Jersey New Brunswick	94	New York University *	28
St. Mary's University (Texas) *	94	Texas A&M University Kingsville	28
University of California Davis	92	California State University Long Beach	27
Massachusetts Institute of Technology *	91	University of California San Diego	25
University of California San Diego	87	University of California Santa Cruz	25
University of South Florida	87	University of South Florida	25
Harvard University *	86	University of Houston University Park	24
Florida State University	84	University of Puerto Rico Central Admin	24
San Francisco State University	84	St. Mary's University (Texas) *	23
California State University Fresno	83	University of Illinois Urbana-Champaign	23
City University of New York Queens College	83	University of Maryland College Park	23
University of Southern California *	83	California State University Sacramento	22
California State University Northridge	81	Inter American University of Puerto Rico San German *	22
University of Houston University Park	80	University of Puerto Rico Cayey University College	22
University of Maryland College Park	79	University of Washington Seattle	22
New Mexico Highlands University	78	California State University Fresno	21
Yale University *	78	Florida State University	21
California State University Fullerton	77	San Jose State University	21
University of Michigan Ann Arbor	75	Princeton University *	20
University of California Santa Cruz	74	Brown University *	19
University of Illinois Urbana-Champaign	73	Columbia University in City of New York *	19
Top 50 as percentage of total	53.0	Top 50 as percentage of total	52.4

* Privately controlled.

NOTES: Institutions are ranked by the number of U.S. Hispanic Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-10. Top 50 U.S. baccalaureate institutions of white, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Baccalaureate institution (1975–99)	Ph.D.s	Baccalaureate institution (1995–99)	Ph.D.s
All U.S. institutions	550,345	All U.S. institutions	113,543
University of California Berkeley	7,373	University of California Berkeley	1,491
University of Michigan Ann Arbor	6,469	University of Illinois Urbana-Champaign	1,314
University of Illinois Urbana-Champaign	6,260	University of Michigan Ann Arbor	1,285
University of Wisconsin Madison	5,862	Cornell University *	1,257
Cornell University *	5,704	University of Wisconsin Madison	1,210
Pennsylvania State University University Park	5,509	Pennsylvania State University University Park	1,160
Michigan State University	4,841	University of Texas Austin	1,013
Ohio State University Columbus	4,635	University of Minnesota Twin Cities	932
University of California Los Angeles	4,592	Ohio State University Columbus	911
University of Texas Austin	4,545	Brigham Young University *	904
University of Minnesota Twin Cities	4,431	Harvard University *	884
Harvard University *	3,942	Michigan State University	864
Rutgers State University of New Jersey New Brunswick	3,763	University of California Los Angeles	799
Massachusetts Institute of Technology *	3,705	Yale University *	776
Purdue University West Lafayette	3,683	Texas A&M University College Station	764
Brigham Young University *	3,615	Purdue University West Lafayette	740
Indiana University Bloomington	3,430	University of Florida	721
Stanford University *	3,381	Indiana University Bloomington	719
University of Maryland College Park	3,381	University of Pennsylvania *	704
University of Washington Seattle	3,370	Massachusetts Institute of Technology *	692
University of Florida	3,245	University of Virginia Charlottesville	691
University of Pennsylvania *	3,218	Stanford University *	682
Yale University *	3,104	University of California Davis	673
University of Colorado Boulder	2,988	University of Colorado Boulder	668
University of California Davis	2,875	Rutgers State University of New Jersey New Brunswick	653
University of North Carolina Chapel Hill	2,867	Brown University *	621
State University of New York at Buffalo	2,864	Princeton University *	621
University of Massachusetts Amherst	2,745	University of North Carolina Chapel Hill	619
Brown University *	2,603	Virginia Polytechnic Institute and State University	617
University of Missouri Columbia	2,601	University of Washington Seattle	613
Princeton University *	2,600	Duke University *	612
Iowa State University	2,574	University of Maryland College Park	581
Duke University *	2,560	University of Massachusetts Amherst	581
Northwestern University *	2,529	University of Iowa	553
University of California Santa Barbara	2,510	Iowa State University	551
Florida State University	2,501	State University of New York at Buffalo	550
Texas A&M University College Station	2,441	University of Chicago *	521
Boston University *	2,370	University of California San Diego	515
University of Iowa	2,359	Northwestern University *	511
University of Kansas Lawrence	2,358	Oberlin College *	511
City University of New York Brooklyn College	2,348	University of Arizona	499
University of Virginia Charlottesville	2,324	University of California Santa Barbara	499
Columbia University in City of New York *	2,317	University of California Santa Cruz	492
University of Rochester *	2,289	University of Missouri Columbia	481
University of Chicago *	2,281	University of Nebraska Lincoln	462
Oberlin College *	2,256	Florida State University	447
Virginia Polytechnic Institute and State University	2,214	University of Georgia	447
University of Pittsburgh Pittsburgh	2,210	College of William and Mary	446
University of Nebraska Lincoln	2,148	Boston University *	445
City University of New York City College	2,133	University of Notre Dame *	444
Top 50 as percentage of total	30.7	Top 50 as percentage of total	31.5

* Privately controlled.

NOTES: Institutions are ranked by the number of U.S. white Ph.D.s who received a baccalaureate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-11. Doctorate production in the 50 U.S. states, District of Columbia, and Puerto Rico: 1920–99, 1920–24, and 1995–99

1920–99		1920–24		1995–99	
Location	Ph.D.s	Location	Ph.D.s	Location	Ph.D.s
All locations	1,354,873	All locations	4,199	All locations	210,535
New York	151,545	New York	879	California	24,153
California	150,447	Illinois	674	New York	18,624
Illinois	86,648	Massachusetts	490	Texas	13,552
Massachusetts	81,086	Maryland	283	Illinois	11,321
Pennsylvania	72,138	Wisconsin	275	Pennsylvania	11,039
Texas	67,140	California	262	Massachusetts	10,861
Michigan	57,823	Connecticut	228	Ohio	9,059
Ohio	57,299	Pennsylvania	188	Florida	8,969
Indiana	44,640	Iowa	145	Michigan	7,470
Florida	39,284	District of Columbia	141	Indiana	5,441
Wisconsin	37,515	New Jersey	115	North Carolina	5,316
North Carolina	31,148	Michigan	113	Virginia	5,084
Maryland	28,495	Minnesota	105	Maryland	4,832
Iowa	27,926	Ohio	92	Wisconsin	4,602
New Jersey	27,888	Indiana	37	Georgia	4,563
Minnesota	26,344	Missouri	37	New Jersey	4,352
Connecticut	24,863	Rhode Island	23	Minnesota	4,267
Colorado	24,858	Virginia	21	Colorado	3,817
Missouri	24,476	Tennessee	20	Arizona	3,815
Virginia	22,099	Nebraska	17	Missouri	3,541
Washington	21,967	North Carolina	13	Washington	3,512
Georgia	21,669	Washington	12	Tennessee	3,361
District of Columbia	21,445	Kansas	10	Iowa	3,261
Tennessee	20,568	Colorado	8	Connecticut	3,085
Arizona	17,077	Texas	8	Louisiana	2,666
Oregon	15,881	Arizona	2	Alabama	2,594
Oklahoma	15,216	Louisiana	1	District of Columbia	2,457
Kansas	14,887	Alabama	0	Kansas	2,303
Louisiana	14,201	Alaska	0	Oregon	2,132
Utah	13,771	Arkansas	0	Oklahoma	2,036
Alabama	10,944	Delaware	0	South Carolina	1,984
Nebraska	8,997	Florida	0	Utah	1,871
Mississippi	8,848	Georgia	0	Mississippi	1,760
Rhode Island	8,164	Hawaii	0	Kentucky	1,667
Kentucky	8,149	Idaho	0	Nebraska	1,459
South Carolina	8,064	Kentucky	0	New Mexico	1,440
New Mexico	6,940	Maine	0	Rhode Island	1,205
Arkansas	4,330	Mississippi	0	Hawaii	835
West Virginia	4,131	Montana	0	Delaware	832
Hawaii	4,017	Nevada	0	Arkansas	728
Delaware	3,712	New Hampshire	0	West Virginia	714
North Dakota	2,567	New Mexico	0	New Hampshire	514
Wyoming	2,387	North Dakota	0	Puerto Rico	454
New Hampshire	2,376	Oklahoma	0	Idaho	430
Montana	2,223	Oregon	0	Montana	403
Idaho	2,081	South Carolina	0	Nevada	398
South Dakota	1,739	South Dakota	0	North Dakota	386
Vermont	1,349	Utah	0	South Dakota	378
Nevada	1,158	Vermont	0	Wyoming	347
Maine	1,074	West Virginia	0	Vermont	282
Puerto Rico	910	Wyoming	0	Maine	235
Alaska	369	Puerto Rico	0	Alaska	128

NOTE: Locations that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-12. Science and engineering and non-science and engineering doctorate production in the 50 U.S. states, District of Columbia, and Puerto Rico: 1995–99

Science and engineering		Non-science and engineering	
Location	Ph.D.s	Location	Ph.D.s
All locations	134,271	All locations	76,264
California	17,284	California	6,869
New York	11,974	New York	6,650
Texas	8,411	Texas	5,141
Massachusetts	7,551	Florida	4,768
Illinois	7,039	Pennsylvania	4,347
Pennsylvania	6,692	Illinois	4,282
Ohio	5,477	Ohio	3,582
Michigan	5,040	Massachusetts	3,310
Florida	4,201	Michigan	2,430
North Carolina	3,629	Indiana	1,950
Indiana	3,491	Minnesota	1,918
Maryland	3,311	Virginia	1,848
Virginia	3,236	Georgia	1,708
Wisconsin	3,104	North Carolina	1,687
New Jersey	3,032	Tennessee	1,588
Georgia	2,855	Maryland	1,521
Colorado	2,739	Wisconsin	1,498
Minnesota	2,349	Arizona	1,483
Arizona	2,332	Missouri	1,337
Washington	2,297	New Jersey	1,320
Missouri	2,204	Washington	1,215
Iowa	2,100	Iowa	1,161
Connecticut	1,999	Louisiana	1,135
Tennessee	1,773	Connecticut	1,086
Alabama	1,543	Colorado	1,078
Louisiana	1,531	Alabama	1,051
District of Columbia	1,507	Mississippi	961
Oregon	1,467	District of Columbia	950
Utah	1,388	Kansas	931
Kansas	1,372	Oklahoma	905
Oklahoma	1,131	South Carolina	869
South Carolina	1,115	Kentucky	690
Kentucky	977	Oregon	665
New Mexico	905	Nebraska	606
Rhode Island	887	New Mexico	535
Nebraska	853	Utah	483
Mississippi	799	Arkansas	394
Hawaii	635	Rhode Island	318
Delaware	599	West Virginia	314
New Hampshire	439	South Dakota	246
West Virginia	400	Delaware	233
Arkansas	334	Hawaii	200
Puerto Rico	282	Puerto Rico	172
Montana	280	Idaho	162
Wyoming	276	Nevada	125
Nevada	273	Montana	123
Idaho	268	North Dakota	123
North Dakota	263	New Hampshire	75
Vermont	207	Vermont	75
Maine	166	Wyoming	71
South Dakota	132	Maine	69
Alaska	122	Alaska	6

NOTE: Locations that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-13. Top 50 U.S. doctoral institutions of Ph.D.s: 1920–24 and 1995–99

Doctoral institution (1920–24)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	4,199	All institutions	210,535
University of Chicago *	473	University of Texas Austin	3,842
Columbia University in City of New York *	450	University of California Berkeley	3,819
Harvard University *	371	University of Wisconsin Madison	3,740
Johns Hopkins University *	280	University of Illinois Urbana-Champaign	3,543
University of Wisconsin Madison	272	University of Minnesota Twin Cities	3,495
Cornell University *	258	University of Michigan Ann Arbor	3,381
Yale University *	228	Ohio State University Columbus	3,317
University of California Berkeley	184	University of California Los Angeles	3,083
University of Illinois Urbana-Champaign	176	Stanford University *	2,885
University of Pennsylvania *	124	Pennsylvania State University University Park	2,830
University of Iowa	122	Harvard University *	2,807
University of Michigan Ann Arbor	113	Texas A&M University College Station	2,705
University of Minnesota Twin Cities	105	Massachusetts Institute of Technology *	2,535
Princeton University *	94	University of Washington Seattle	2,501
Ohio State University Columbus	88	Cornell University *	2,487
Fordham University *	81	Nova Southeastern University *	2,474
New York University *	80	Purdue University West Lafayette	2,454
Catholic University of America *	75	University of Maryland College Park	2,426
Stanford University *	66	University of Southern California *	2,242
Massachusetts Institute of Technology *	57	University of Pennsylvania *	2,209
Clark University *	45	Columbia University in City of New York *	2,208
George Washington University *	42	University of Florida	2,147
University of Pittsburgh Pittsburgh	29	Michigan State University	2,133
Indiana University Bloomington	28	University of Arizona	2,047
Northwestern University *	25	Indiana University Bloomington	1,979
Bryn Mawr College *	24	New York University *	1,940
Brown University *	23	University of North Carolina Chapel Hill	1,886
Iowa State University	23	Rutgers State University of New Jersey New Brunswick	1,878
University of Virginia Charlottesville	21	University of Chicago *	1,862
Washington University Saint Louis *	21	University of Pittsburgh Pittsburgh	1,829
Rutgers State University of New Jersey New Brunswick	20	University of Colorado Boulder	1,783
Vanderbilt University *	20	Northwestern University *	1,767
American University *	17	Virginia Polytechnic Institute and State University	1,766
University of Nebraska Lincoln	17	Yale University *	1,752
University of Missouri Columbia	16	University of Georgia	1,747
University of North Carolina Chapel Hill	13	University of California Davis	1,732
California Institute of Technology *	12	University of Iowa	1,717
University of Washington Seattle	12	University of Virginia Charlottesville	1,633
Boston University *	11	Johns Hopkins University *	1,621
University of Kansas Lawrence	10	North Carolina State University Raleigh	1,621
University of Notre Dame *	9	State University of New York at Buffalo	1,547
Georgetown University *	7	City University of New York Graduate Center	1,515
Annenberg Research Institute *	6	University of Massachusetts Amherst	1,492
Rensselaer Polytechnic Institute *	6	Florida State University	1,469
Carnegie Mellon University *	5	Arizona State University Tempe	1,454
University of Colorado Boulder	5	Temple University	1,453
Rice University *	4	Boston University *	1,429
University of Cincinnati	4	Iowa State University	1,416
University of Massachusetts Amherst	4	Princeton University *	1,398
University of Texas Austin	4	University of Kansas Lawrence	1,352
Top 50 as percentage of total	99.5	Top 50 as percentage of total	52.4

* Privately controlled.

NOTES: Institutions are ranked by the number of Ph.D.s who received a doctorate from the institution; see also chapter 5. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-14. Top 50 U.S. doctoral institutions of science and engineering Ph.D.s: 1920–99 and 1995–99

Doctoral institution (1920–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	835,221	All institutions	134,271
University of California Berkeley	25,167	University of California Berkeley	2,785
University of Wisconsin Madison	22,682	University of Wisconsin Madison	2,617
University of Illinois Urbana-Champaign	21,705	University of Illinois Urbana-Champaign	2,540
Massachusetts Institute of Technology *	18,669	Massachusetts Institute of Technology *	2,380
University of Michigan Ann Arbor	18,183	University of Michigan Ann Arbor	2,320
Cornell University *	17,984	University of Texas Austin	2,286
University of Minnesota Twin Cities	16,397	Stanford University *	2,250
Ohio State University Columbus	16,060	University of Minnesota Twin Cities	2,164
Stanford University *	15,695	Texas A&M University College Station	2,103
Purdue University West Lafayette	15,506	Ohio State University Columbus	2,053
Harvard University *	15,310	Cornell University *	2,022
Columbia University in City of New York *	14,339	Purdue University West Lafayette	1,969
University of California Los Angeles	13,179	University of California Los Angeles	1,916
University of Chicago *	12,955	Pennsylvania State University University Park	1,862
University of Texas Austin	12,643	University of Washington Seattle	1,683
Michigan State University	11,732	University of Maryland College Park	1,671
Pennsylvania State University University Park	11,334	University of Florida	1,635
University of Pennsylvania *	10,920	Harvard University *	1,591
Iowa State University	10,628	University of California Davis	1,495
University of Washington Seattle	10,456	Michigan State University	1,492
Yale University *	10,121	University of Arizona	1,432
New York University *	9,835	University of Pennsylvania *	1,406
University of Maryland College Park	9,541	Columbia University in City of New York *	1,369
Northwestern University *	9,219	University of Colorado Boulder	1,354
Texas A&M University College Station	9,113	University of Southern California *	1,321
University of Florida	8,401	North Carolina State University Raleigh	1,309
Princeton University *	8,228	Rutgers State University of New Jersey New Brunswick	1,301
University of California Davis	8,077	Northwestern University *	1,267
Johns Hopkins University *	7,989	University of Chicago *	1,194
Rutgers State University of New Jersey New Brunswick	7,809	Iowa State University	1,183
University of Southern California *	7,702	University of California San Diego	1,178
University of Iowa	7,176	Virginia Polytechnic Institute and State University	1,150
University of Colorado Boulder	7,172	University of North Carolina Chapel Hill	1,145
Indiana University Bloomington	7,107	Georgia Institute of Technology	1,117
University of North Carolina Chapel Hill	7,101	Yale University *	1,108
University of Arizona	6,985	Johns Hopkins University *	1,102
University of Pittsburgh Pittsburgh	6,954	City University of New York Graduate Center	1,034
North Carolina State University Raleigh	6,663	Princeton University *	1,002
California Institute of Technology *	6,271	University of Pittsburgh Pittsburgh	966
Duke University *	5,769	State University of New York at Stony Brook	964
Case Western Reserve University *	5,715	University of Virginia Charlottesville	956
Virginia Polytechnic Institute and State University	5,704	State University of New York at Buffalo	944
University of Missouri Columbia	5,696	University of Georgia	925
State University of New York at Buffalo	5,630	Indiana University Bloomington	911
University of Massachusetts Amherst	5,552	Duke University *	908
University of Kansas Lawrence	5,550	University of Massachusetts Amherst	906
University of Rochester *	5,399	University of Iowa	875
University of Tennessee Knoxville	5,258	Colorado State University	869
Oregon State University	5,170	California Institute of Technology *	849
University of Virginia Charlottesville	5,126	Boston University *	836
Top 50 as percentage of total	62.7	Top 50 as percentage of total	54.9

* Privately controlled.

NOTE: Institutions are ranked by the number of science and engineering Ph.D.s who received a doctorate from the institution.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-15. Top 50 U.S. doctoral institutions of non-science and engineering Ph.D.s: 1920–99 and 1995–99

Doctoral institution (1920–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	519,652	All institutions	76,264
Harvard University *	12,807	Nova Southeastern University *	1,977
New York University *	12,071	University of Texas Austin	1,556
Indiana University Bloomington	11,546	University of Minnesota Twin Cities	1,331
Columbia University in City of New York *	11,376	Ohio State University Columbus	1,264
Teachers College Columbia University *	11,279	Harvard University *	1,216
University of Wisconsin Madison	11,152	University of California Los Angeles	1,167
Ohio State University Columbus	10,902	New York University *	1,153
University of Michigan Ann Arbor	10,479	University of Wisconsin Madison	1,123
University of Illinois Urbana-Champaign	9,176	Indiana University Bloomington	1,068
University of Southern California *	9,004	University of Michigan Ann Arbor	1,061
University of Texas Austin	8,965	University of California Berkeley	1,034
University of California Berkeley	8,851	University of Illinois Urbana-Champaign	1,003
University of Minnesota Twin Cities	8,591	Pennsylvania State University University Park	968
University of Iowa	8,062	University of Southern California *	921
University of Pittsburgh Pittsburgh	7,659	Florida State University	898
University of Chicago *	7,644	Temple University	877
University of California Los Angeles	7,421	Teachers College Columbia University *	871
Nova Southeastern University *	7,376	University of Pittsburgh Pittsburgh	863
Michigan State University	7,108	University of Iowa	842
Yale University *	7,081	Columbia University in City of New York *	839
Stanford University *	6,766	University of Georgia	822
Florida State University	6,380	University of Washington Seattle	818
University of Pennsylvania *	6,276	University of Pennsylvania *	803
Boston University *	6,266	University of Maryland College Park	755
Pennsylvania State University University Park	6,070	University of North Carolina Chapel Hill	741
Temple University	5,532	University of South Carolina Columbia	735
University of North Carolina Chapel Hill	5,411	University of Virginia Charlottesville	677
Northwestern University *	5,362	University of Chicago *	668
University of Maryland College Park	5,273	University of Kansas Lawrence	660
University of Washington Seattle	5,137	Yale University *	644
Vanderbilt University *	4,840	Michigan State University	641
University of Georgia	4,832	Stanford University *	635
Catholic University of America *	4,566	Arizona State University Tempe	623
University of Oregon	4,550	Virginia Polytechnic Institute and State University	616
University of Missouri Columbia	4,428	University of Arizona	615
Cornell University *	4,393	State University of New York at Buffalo	603
Rutgers State University of New Jersey New Brunswick	4,390	Texas A&M University College Station	602
University of Massachusetts Amherst	4,390	Boston University *	593
University of Virginia Charlottesville	4,106	University of Massachusetts Amherst	586
University of Nebraska Lincoln	4,080	Rutgers State University of New Jersey New Brunswick	577
State University of New York at Buffalo	4,039	University of Nebraska Lincoln	571
University of Northern Colorado	3,978	University of Alabama Tuscaloosa	558
University of Florida	3,816	University of North Texas	551
University of Kansas Lawrence	3,805	Johns Hopkins University *	519
University of Colorado Boulder	3,650	University of Tennessee Knoxville	517
Johns Hopkins University *	3,613	University of Florida	512
Wayne State University	3,485	University of Cincinnati	503
Southern Illinois University Carbondale	3,401	Northwestern University *	500
University of North Texas	3,382	Oklahoma State University Stillwater	486
Oklahoma State University Stillwater	3,312	Purdue University West Lafayette	485
		University of Missouri Columbia	485
Top 50 as percentage of total	63.1	Top 51 as percentage of total[a]	53.9

* Privately controlled.

[a] Because two institutions tied for 50th place, 51 institutions are included in percentage of total.

NOTES: Institutions are ranked by the number of non–science and engineering Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-16. Top 50 U.S. doctoral institutions of male Ph.D.s: 1920–99 and 1995–99

Doctoral institution (1920–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	983,168	All institutions	123,496
University of Wisconsin Madison	26,680	University of California Berkeley	2,429
University of California Berkeley	26,669	University of Illinois Urbana-Champaign	2,373
University of Illinois Urbana-Champaign	25,062	University of Texas Austin	2,365
University of Michigan Ann Arbor	21,795	University of Wisconsin Madison	2,279
Harvard University *	21,652	University of Michigan Ann Arbor	2,099
Ohio State University Columbus	20,372	University of Minnesota Twin Cities	2,049
University of Minnesota Twin Cities	18,936	Ohio State University Columbus	2,034
Columbia University in City of New York *	18,355	Stanford University *	2,014
Stanford University *	18,027	Texas A&M University College Station	1,961
Cornell University *	17,816	Massachusetts Institute of Technology *	1,870
Massachusetts Institute of Technology *	16,972	Pennsylvania State University University Park	1,785
University of Chicago *	16,130	University of California Los Angeles	1,774
Purdue University West Lafayette	15,545	Purdue University West Lafayette	1,687
University of Texas Austin	15,503	Cornell University *	1,575
Michigan State University	14,780	Harvard University *	1,570
University of California Los Angeles	14,656	University of Washington Seattle	1,475
New York University *	14,605	University of Florida	1,399
Indiana University Bloomington	13,632	University of Maryland College Park	1,391
Pennsylvania State University University Park	13,467	University of Southern California *	1,323
Yale University *	13,114	University of Arizona	1,314
University of Pennsylvania *	12,335	Columbia University in City of New York *	1,306
University of Southern California *	11,987	Michigan State University	1,297
University of Iowa	11,717	University of Pennsylvania *	1,266
University of Washington Seattle	11,562	University of Chicago *	1,212
Northwestern University *	10,846	University of Colorado Boulder	1,111
Iowa State University	10,276	Virginia Polytechnic Institute and State University	1,098
University of Pittsburgh Pittsburgh	10,018	University of California Davis	1,090
University of Maryland College Park	9,920	Indiana University Bloomington	1,067
Princeton University *	9,625	Rutgers State University of New Jersey New Brunswick	1,063
Texas A&M University College Station	9,585	North Carolina State University Raleigh	1,056
University of Florida	9,156	Northwestern University *	1,043
University of North Carolina Chapel Hill	8,513	Yale University *	1,042
Johns Hopkins University *	8,496	Nova Southeastern University *	1,036
Rutgers State University of New Jersey New Brunswick	8,365	University of Iowa	1,023
University of Missouri Columbia	7,963	University of Pittsburgh Pittsburgh	1,007
University of Colorado Boulder	7,837	Iowa State University	974
University of Arizona	7,225	Princeton University *	962
Florida State University	7,019	University of Virginia Charlottesville	961
State University of New York at Buffalo	6,910	University of North Carolina Chapel Hill	953
University of California Davis	6,785	Georgia Institute of Technology	951
University of Kansas Lawrence	6,678	Johns Hopkins University *	925
University of Virginia Charlottesville	6,625	University of Georgia	914
University of Nebraska Lincoln	6,616	University of California San Diego	911
University of Georgia	6,466	State University of New York at Buffalo	908
University of Massachusetts Amherst	6,463	New York University *	877
Duke University *	6,454	Arizona State University Tempe	868
Boston University *	6,361	Florida State University	861
North Carolina State University Raleigh	6,261	University of Massachusetts Amherst	801
University of Tennessee Knoxville	6,151	State University of New York at Stony Brook	784
Teachers College Columbia University *	6,139	Boston University *	782
Top 50 as percentage of total	62.5	Top 50 as percentage of total	54.2

* Privately controlled.

NOTE: Institutions are ranked by the number of male Ph.D.s who received a doctorate from the institution.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-17. Top 50 U.S. doctoral institutions of female Ph.D.s: 1920–99 and 1995–99

Doctoral institution (1920–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	369,819	All institutions	85,960
Columbia University in City of New York *	7,353	University of Texas Austin	1,476
University of California Berkeley	7,345	University of Wisconsin Madison	1,445
New York University *	7,289	University of Minnesota Twin Cities	1,417
University of Wisconsin Madison	7,119	Nova Southeastern University *	1,409
University of Michigan Ann Arbor	6,852	University of California Berkeley	1,390
Ohio State University Columbus	6,579	University of California Los Angeles	1,277
Harvard University *	6,360	University of Michigan Ann Arbor	1,277
University of Texas Austin	6,103	Ohio State University Columbus	1,272
University of Minnesota Twin Cities	6,017	Harvard University *	1,171
University of California Los Angeles	5,903	University of Illinois Urbana-Champaign	1,124
University of Illinois Urbana-Champaign	5,713	New York University *	1,060
Teachers College Columbia University *	5,154	Pennsylvania State University University Park	1,041
Indiana University Bloomington	5,016	University of Maryland College Park	1,030
University of Maryland College Park	4,885	University of Washington Seattle	1,019
University of Pennsylvania *	4,858	University of Pennsylvania *	942
University of Southern California *	4,689	University of North Carolina Chapel Hill	933
University of Pittsburgh Pittsburgh	4,574	Cornell University *	912
Cornell University *	4,561	Indiana University Bloomington	907
University of Chicago *	4,447	University of Southern California *	906
Stanford University *	4,420	Columbia University in City of New York *	900
Boston University *	4,108	Stanford University *	858
Yale University *	4,083	University of Georgia	831
Michigan State University	4,041	Michigan State University	824
University of Washington Seattle	4,016	Rutgers State University of New Jersey New Brunswick	815
University of North Carolina Chapel Hill	3,997	University of Pittsburgh Pittsburgh	802
Pennsylvania State University University Park	3,933	Purdue University West Lafayette	764
Nova Southeastern University *	3,899	University of Florida	748
Rutgers State University of New Jersey New Brunswick	3,834	Texas A&M University College Station	738
Northwestern University *	3,727	Temple University	734
University of Massachusetts Amherst	3,479	University of Arizona	730
University of Iowa	3,476	Northwestern University *	719
Florida State University	3,363	City University of New York Graduate Center	716
University of Georgia	3,361	Yale University *	706
Temple University	3,212	University of Massachusetts Amherst	691
Purdue University West Lafayette	3,132	Johns Hopkins University *	673
City University of New York Graduate Center	3,083	University of Virginia Charlottesville	671
University of Florida	3,060	University of Iowa	670
Johns Hopkins University *	3,055	University of Colorado Boulder	667
University of Colorado Boulder	2,975	Virginia Polytechnic Institute and State University	651
State University of New York at Buffalo	2,757	University of California Davis	639
University of Kansas Lawrence	2,674	University of Chicago *	639
Vanderbilt University *	2,646	University of Kansas Lawrence	639
University of Virginia Charlottesville	2,606	State University of New York at Buffalo	637
University of Arizona	2,542	University of South Carolina Columbia	629
Fordham University *	2,472	Boston University *	628
Texas A&M University College Station	2,407	Teachers College Columbia University *	618
Catholic University of America *	2,398	Florida State University	607
Wayne State University	2,384	Arizona State University Tempe	582
University of Tennessee Knoxville	2,342	North Carolina State University Raleigh	564
University of Connecticut	2,290	Massachusetts Institute of Technology *	557
Top 50 as percentage of total	56.9	Top 50 as percentage of total	50.8

* Privately controlled.

NOTES: Institutions are ranked by the number of female Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-18. Top 50 U.S. doctoral institutions of American Indian/Alaskan Native, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Doctoral institution (1975–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	2,722	All institutions	910
Oklahoma State University Stillwater	93	Oklahoma State University Stillwater	29
University of Oklahoma Norman	85	University of Oklahoma Norman	26
Pennsylvania State University University Park	64	Pennsylvania State University University Park	18
University of Washington Seattle	57	University of California Los Angeles	18
University of Wisconsin Madison	46	University of Washington Seattle	18
University of Arizona	44	University of Arkansas Fayetteville	17
University of Texas Austin	43	Stanford University *	15
University of California Berkeley	41	University of Michigan Ann Arbor	15
Stanford University *	40	University of Arizona	14
University of California Los Angeles	39	North Carolina State University Raleigh	13
University of Michigan Ann Arbor	39	University of Minnesota Twin Cities	13
University of Arkansas Fayetteville	38	University of Texas Austin	13
University of New Mexico Albuquerque	37	University of Georgia	12
University of South Dakota	37	Nova Southeastern University *	11
Nova Southeastern University *	36	University of Maryland College Park	11
Texas A&M University College Station	35	University of New Mexico Albuquerque	11
Michigan State University	33	University of North Dakota Grand Forks	11
University of Minnesota Twin Cities	33	University of Wisconsin Madison	11
Harvard University *	32	Arizona State University Tempe	10
North Carolina State University Raleigh	32	Michigan State University	10
Ohio State University Columbus	32	Ohio State University Columbus	10
University of North Dakota Grand Forks	29	Purdue University West Lafayette	10
University of Missouri Columbia	27	University of California Berkeley	10
University of Tennessee Knoxville	27	University of California Santa Barbara	10
Arizona State University Tempe	26	Northern Arizona University	9
Northern Arizona University	26	Texas A&M University College Station	9
University of California Davis	25	University of California Davis	9
University of Georgia	25	University of North Texas	9
University of Oregon	25	California School of Professional Psychology Los Angeles *	8
Florida State University	24	Harvard University *	8
Indiana University Bloomington	24	University of Missouri Columbia	8
Purdue University West Lafayette	24	University of North Carolina Chapel Hill	8
University of Illinois Urbana-Champaign	24	University of Pennsylvania *	8
University of North Texas	24	University of Sarasota *	8
University of Southern California *	24	Auburn University Auburn	7
Cornell University *	23	Cornell University *	7
University of Florida	23	Florida State University	7
University of North Carolina Chapel Hill	23	Montana State University Bozeman	7
University of Nebraska Lincoln	22	University of Florida	7
University of Maryland College Park	21	University of Kansas Lawrence	7
University of Utah	21	University of Nebraska Lincoln	7
University of Kansas Lawrence	19	Walden University *	7
New York University *	18	Colorado State University	6
University of California Santa Barbara	18	University of California Riverside	6
Columbia University in City of New York *	17	University of Kentucky	6
Louisiana State University and A&M College	17	University of Mississippi University	6
Washington State University	17	University of Missouri Saint Louis	6
Southern Illinois University Carbondale	16	University of San Francisco *	6
University of Colorado Boulder	16	Virginia Polytechnic Institute and State University	6
Vanderbilt University *	16		
Top 50 as percent of total	57.9	Top 49 as percentage of total[a]	56.9

* Privately controlled.

[a] Because 13 institutions tied for 50th place (each with a count of 5), only 49 institutions are listed and are included in the total.

NOTES: Institutions are ranked by the number of U.S. American Indian/Alaskan Native Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-19. Top 50 U.S. doctoral institutions of Asian/Pacific Islander, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Doctoral institution (1975–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	17,156	All institutions	6,039
University of California Berkeley	900	University of California Berkeley	317
University of California Los Angeles	824	University of California Los Angeles	285
Stanford University *	559	Stanford University *	203
University of Southern California *	390	Massachusetts Institute of Technology *	145
Massachusetts Institute of Technology *	379	Harvard University *	141
University of Illinois Urbana-Champaign	372	University of Michigan Ann Arbor	132
Harvard University *	350	University of Illinois Urbana-Champaign	123
University of Michigan Ann Arbor	349	University of California Davis	120
University of Hawaii Manoa	317	Columbia University in City of New York *	117
University of Washington Seattle	317	University of Southern California *	111
Columbia University in City of New York *	314	University of Washington Seattle	94
University of California Davis	297	Purdue University West Lafayette	92
University of Wisconsin Madison	253	Northwestern University *	81
Cornell University *	223	University of California Irvine	81
New York University *	218	University of Pennsylvania *	81
Purdue University West Lafayette	211	New York University *	79
University of Maryland College Park	210	University of Maryland College Park	79
University of Pennsylvania *	206	University of Wisconsin Madison	79
Northwestern University *	205	University of Texas Austin	77
University of California San Diego	198	Johns Hopkins University *	74
University of Minnesota Twin Cities	198	University of California San Diego	74
University of Texas Austin	197	Yale University *	74
Yale University *	188	University of Hawaii Manoa	72
University of Chicago *	187	University of Chicago *	71
Ohio State University Columbus	185	University of California Santa Barbara	65
University of California Irvine	185	University of Minnesota Twin Cities	62
Rutgers State University of New Jersey New Brunswick	167	Cornell University *	61
Johns Hopkins University *	163	Princeton University *	58
Princeton University *	158	University of California San Francisco	54
University of California Santa Barbara	150	California Institute of Technology *	52
California Institute of Technology *	143	Rutgers State University of New Jersey New Brunswick	49
City University of New York Graduate Center	131	Boston University *	45
University of Illinois Chicago	131	Pennsylvania State University University Park	45
Michigan State University	126	Georgia Institute of Technology	43
University of California San Francisco	125	Texas A&M University College Station	43
Boston University *	119	University of Colorado Boulder	43
Pennsylvania State University University Park	119	Ohio State University Columbus	42
Texas A&M University College Station	118	University of Arizona	42
University of Pittsburgh Pittsburgh	118	University of Virginia Charlottesville	42
State University of New York at Buffalo	114	University of North Carolina Chapel Hill	40
University of Colorado Boulder	113	State University of New York at Stony Brook	39
University of San Francisco *	109	University of Illinois Chicago	38
Indiana University Bloomington	105	University of San Francisco *	38
University of Massachusetts Amherst	105	Washington University Saint Louis *	38
University of Arizona	102	Nova Southeastern University *	36
Teachers College Columbia University *	100	North Carolina State University Raleigh	34
State University of New York at Stony Brook	99	State University of New York at Buffalo	34
University of North Carolina Chapel Hill	97	University of Pittsburgh Pittsburgh	34
Nova Southeastern University *	96	Michigan State University	33
University of California Riverside	96	University of Massachusetts Amherst	33
Top 50 as percentage of total	64.9	Top 50 as percentage of total	65.3

* Privately controlled.

NOTES: Institutions are ranked by the number of U.S. Asian/Pacific Islander Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-20. Top 50 U.S. doctoral institutions of black, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Doctoral institution (1975–99)	Ph.D.s
All institutions	26,574
Nova Southeastern University *	939
University of Michigan Ann Arbor	720
Howard University *,†	716
Ohio State University Columbus	616
University of Maryland College Park	521
Clark Atlanta University *,†	508
Teachers College Columbia University *	504
University of Pittsburgh Pittsburgh	469
Wayne State University	460
Florida State University	457
Michigan State University	419
University of Massachusetts Amherst	407
Temple University	395
University of Illinois Urbana-Champaign	347
University of California Berkeley	346
George Washington University *	342
Vanderbilt University *	336
Virginia Polytechnic Institute and State University	335
Rutgers State University of New Jersey New Brunswick	319
University of North Carolina Chapel Hill	297
Harvard University *	291
University of California Los Angeles	289
Southern Illinois University Carbondale	285
New York University *	281
Indiana University Bloomington	274
Stanford University *	261
University of South Carolina Columbia	259
University of Florida	255
University of Texas Austin	237
University of Southern California *	234
North Carolina State University Raleigh	229
Northwestern University *	229
University of Alabama Tuscaloosa	229
Pennsylvania State University University Park	224
University of Cincinnati	222
Georgia State University	217
University of Pennsylvania *	216
University of Wisconsin Madison	210
Columbia University in City of New York *	208
Saint Louis University Saint Louis *	208
Kansas State University Manhattan	207
University of Minnesota Twin Cities	202
University of Georgia	199
City University of New York Graduate Center	192
Texas Southern University †	187
University of Virginia Charlottesville	186
State University of New York at Buffalo	183
Cornell University *	182
University of Tennessee Knoxville	179
University of Houston University Park	178
Top 50 as percentage of total	61.0

Doctoral institution (1995–99)	Ph.D.s
All institutions	7,048
Nova Southeastern University *	290
Howard University *,†	239
University of Michigan Ann Arbor	143
Ohio State University Columbus	131
University of Maryland College Park	122
Virginia Polytechnic Institute and State University	122
Wayne State University	114
Teachers College Columbia University *	101
Florida State University	100
Temple University	96
North Carolina State University Raleigh	95
Clark Atlanta University *,†	92
University of Illinois Urbana-Champaign	92
University of North Carolina Chapel Hill	85
Michigan State University	83
University of Texas Austin	78
University of Pennsylvania *	77
Walden University *	77
University of California Los Angeles	76
University of South Carolina Columbia	76
University of California Berkeley	73
Pennsylvania State University University Park	72
Texas Southern University†	71
Harvard University *	69
Stanford University *	67
University of Cincinnati	66
University of Florida	66
University of Pittsburgh Pittsburgh	66
New York University *	65
George Washington University *	60
University of Virginia Charlottesville	60
University of Alabama Tuscaloosa	59
Northwestern University *	57
Loyola University of Chicago *	56
Georgia State University	53
Saint Louis University Saint Louis *	52
University of Southern California *	52
University of Minnesota Twin Cities	50
University of San Francisco *	50
Emory University *	49
University of Alabama Birmingham	49
City University of New York Graduate Center	48
Purdue University West Lafayette	48
State University of New York at Buffalo	48
Texas A&M University College Station	48
University of Massachusetts Amherst	47
University of Missouri Columbia	46
University of Iowa	45
University of Georgia	44
Cornell University *	43
University of Southern Mississippi	43
Vanderbilt University *	43
Top 52 as percentage of total[a]	57.5

* Privately controlled.

† Historically black college or university.

[a] Because three institutions tied for 50th place, 52 institutions are listed and are included in percentage of total.

NOTES: Institutions are ranked by the number of U.S. black Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-21. Top 50 U.S. doctoral institutions of Hispanic, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Doctoral institution (1975–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	16,651	All institutions	5,218
University of Texas Austin	626	University of Texas Austin	189
University of California Los Angeles	437	University of Puerto Rico Rio Piedras	162
University of California Berkeley	423	University of California Berkeley	152
University of Puerto Rico Rio Piedras	374	Carlos Albizu University (Puerto Rico) *	143
New York University *	318	University of California Los Angeles	118
Texas A&M University College Station	312	Texas A&M University College Station	105
Stanford University *	293	Arizona State University Tempe	84
University of New Mexico Albuquerque	286	Harvard University *	84
University of Southern California *	277	Stanford University *	79
University of Michigan Ann Arbor	273	University of Michigan Ann Arbor	79
Harvard University *	262	University of New Mexico Albuquerque	77
University of Massachusetts Amherst	247	University of Arizona	76
University of Arizona	242	University of Miami	72
City University of New York Graduate Center	233	University of Southern California *	72
University of Florida	231	Pennsylvania State University University Park	70
University of Miami *	228	University of Wisconsin Madison	67
Pennsylvania State University University Park	218	University of California Davis	66
University of Wisconsin Madison	215	Nova Southeastern University *	63
Nova Southeastern University *	208	New York University *	62
University of Colorado Boulder	208	University of California Santa Barbara	58
Florida State University	189	University of Florida	58
Carlos Albizu University (Puerto Rico) *	184	University of Colorado Boulder	56
Cornell University *	180	City University of New York Graduate Center	53
Teachers College Columbia University *	178	Ohio State University Columbus	53
Columbia University in City of New York *	175	University of Massachusetts Amherst	51
University of Illinois Urbana-Champaign	174	Cornell University *	50
University of Houston University Park	172	Florida International University	47
University of California Santa Barbara	170	University of Illinois Urbana-Champaign	47
University of California Davis	169	Teachers College Columbia University *	46
Ohio State University Columbus	164	University of California San Diego	45
Arizona State University Tempe	159	Columbia University in City of New York *	44
Rutgers State University of New Jersey New Brunswick	155	University of Houston University Park	43
Michigan State University	154	Florida State University	42
Fordham University *	153	Michigan State University	42
University of Washington Seattle	146	New Mexico State University Las Cruces	40
University of California San Diego	143	Rutgers State University of New Jersey New Brunswick	40
University of Maryland College Park	136	Temple University	39
Yale University *	133	University of Washington Seattle	39
University of San Francisco *	126	University of Maryland College Park	38
New Mexico State University Las Cruces	125	University of San Francisco *	38
University of California Riverside	121	Purdue University West Lafayette	37
Boston University *	118	University of Chicago *	37
Purdue University West Lafayette	113	Inter American University of Puerto Rico Metro Campus *	36
Temple University	113	University of Minnesota Twin Cities	36
University of Chicago *	113	University of North Carolina Chapel Hill	36
University of California Irvine	112	Massachusetts Institute of Technology *	35
Indiana University Bloomington	107	University of California Irvine	35
University of Minnesota Twin Cities	105	Northern Arizona University	33
University of Pennsylvania *	105	Princeton University *	33
Massachusetts Institute of Technology *	104	University of California Riverside	33
University of North Carolina Chapel Hill	104		
Top 51 as percentage of total[a]	61.9	Top 50 as percentage of total	60.2

* Privately controlled.

[a] Because two institutions tied for 50th place, 51 institutions are listed and are included in percentage of total.

NOTES: Institutions are ranked by the number of U.S. Hispanic Ph.D.s who received a doctorate from the institution. Institutions that were tied are listed alphabetically.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

TABLE B-22. Top 50 U.S. doctoral institutions of white, U.S. citizen Ph.D.s: 1975–99 and 1995–99

Doctoral institution (1975–99)	Ph.D.s	Doctoral institution (1995–99)	Ph.D.s
All institutions	559,930	All institutions	117,392
University of Wisconsin Madison	11,376	University of California Berkeley	2,288
University of California Berkeley	11,343	University of Wisconsin Madison	2,182
University of Michigan Ann Arbor	9,272	University of Texas Austin	2,041
University of Illinois Urbana-Champaign	9,256	University of Minnesota Twin Cities	1,983
University of Minnesota Twin Cities	9,217	University of Michigan Ann Arbor	1,858
University of Texas Austin	9,088	University of Illinois Urbana-Champaign	1,651
Ohio State University Columbus	9,066	Ohio State University Columbus	1,606
University of California Los Angeles	7,712	University of Washington Seattle	1,557
Indiana University Bloomington	7,548	Pennsylvania State University University Park	1,542
Stanford University *	7,521	University of California Los Angeles	1,508
Harvard University *	7,123	Stanford University *	1,444
Pennsylvania State University University Park	6,981	Harvard University *	1,410
University of Washington Seattle	6,855	Nova Southeastern University *	1,374
Cornell University *	6,724	University of North Carolina Chapel Hill	1,334
University of Maryland College Park	6,659	Indiana University Bloomington	1,323
Michigan State University	6,541	Texas A&M University College Station	1,311
New York University *	6,540	Cornell University *	1,278
University of Pennsylvania *	6,350	University of Pennsylvania *	1,276
Columbia University in City of New York *	6,305	University of Maryland College Park	1,255
University of North Carolina Chapel Hill	6,263	University of Virginia Charlottesville	1,238
Purdue University West Lafayette	6,056	University of Arizona	1,184
Texas A&M University College Station	5,935	University of Colorado Boulder	1,183
University of Georgia	5,696	Purdue University West Lafayette	1,144
University of Pittsburgh Pittsburgh	5,623	University of Georgia	1,135
University of Southern California *	5,548	University of Florida	1,119
University of Chicago *	5,468	New York University *	1,100
Rutgers State University of New Jersey New Brunswick	5,427	University of Chicago *	1,092
Nova Southeastern University *	5,423	Columbia University in City of New York *	1,086
University of Florida	5,409	Northwestern University *	1,037
University of Colorado Boulder	5,366	University of California Davis	1,034
University of Massachusetts Amherst	5,253	Michigan State University	1,016
Northwestern University *	5,221	Rutgers State University of New Jersey New Brunswick	982
Yale University *	5,202	University of Pittsburgh Pittsburgh	978
University of Virginia Charlottesville	5,201	University of Southern California *	957
Florida State University	5,129	Florida State University	952
University of Iowa	5,071	Virginia Polytechnic Institute and State University	946
University of Arizona	4,922	Yale University *	927
Temple University	4,696	Temple University	912
Massachusetts Institute of Technology *	4,570	University of Iowa	902
Boston University *	4,528	University of South Carolina Columbia	896
University of Kansas Lawrence	4,390	University of Kansas Lawrence	875
University of Tennessee Knoxville	4,291	North Carolina State University Raleigh	871
State University of New York at Buffalo	4,258	Massachusetts Institute of Technology *	854
University of California Davis	4,060	Arizona State University Tempe	835
Virginia Polytechnic Institute and State University	4,044	University of Massachusetts Amherst	825
University of Nebraska Lincoln	4,032	University of Nebraska Lincoln	818
Vanderbilt University *	4,005	University of Tennessee Knoxville	815
University of Missouri Columbia	3,986	Johns Hopkins University *	796
Duke University *	3,747	Duke University *	790
Teachers College Columbia University *	3,739	State University of New York at Buffalo	771
Top 50 as percentage of total	54.3	Top 50 as percentage of total	51.4

* Privately controlled.

NOTE: Institutions are ranked by the number of U.S. white Ph.D.s who received a doctorate from the institution.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

APPENDIX C. TECHNICAL NOTES

DEFINITIONS AND EXPLANATIONS

This section provides definitions of key terms used in this report and explanatory information on the treatment of certain variables. For convenience, the Doctorate Records File is referred to as the DRF throughout the section, and the Survey of Earned Doctorates is referred to as the SED.

The degree information in the DRF reflects the first degree earned by the individual at each level, as applicable: first baccalaureate, first master's degree, first professional doctorate, and first research doctorate. Survey forms for any subsequent research doctorates are retained but are not entered into the DRF.

Doctorate recipients report their immediate postgraduation plans for employment or additional study. This report focuses on Ph.D.s who reported definite plans at the time they completed the SED, which is usually shortly before graduation. Ph.D.s with definite plans include those who reported they had signed a contract or had otherwise made a commitment for a new position as well as those who reported they were returning to or continuing in a position held before graduation. Most analyses in this report are further restricted to commitments in the United States.

Age. The age of a doctorate recipient at graduation.

In this report the standard practice is to use the median to report the age of doctorate recipients. Half of the Ph.D.s are older than the median age, and half are younger. The year of birth is required for this computation. The month of birth is used when available.

Carnegie Classification. A system of classification of postsecondary institutions established by the Carnegie Foundation for the Advancement of Teaching.

Carnegie classifications are based on highest degree conferred, fields in which degrees are conferred, number of programs, enrollment, research support, and selectivity of admissions criteria. The classifications are updated periodically by the Carnegie Foundation to reflect changes in the characteristics of institutions. This report used the 1994 Carnegie update to describe the institutions that awarded doctorates in the 1990s. The Carnegie categories are as follows: Research I and II, Doctoral I and II, Master's I and II, Baccalaureate I and II, Associate of Arts (not applicable to this report), Religion and Theology, Medical, Other Health, Engineering, Business, Fine Arts, Law, Teachers College, Other Specialized (e.g., maritime academy, military institute), and Tribal College (not applicable to this report). A majority of the doctorate-granting institutions are classified as Research (126) or Doctoral (109) institutions, and they account for the vast majority of doctorates awarded in the United States. In 1990–99, Research I institutions conferred 68.3 percent of all doctorates; Research II institutions, 11.5 percent; Doctoral I institutions, 10.6 percent; and Doctoral II institutions, 4.4 percent. Although a substantial number of doctorate-granting institutions fall into the "other" Carnegie categories, together they awarded 5.3 percent of all doctorates in the 1990s; these institutions were aggregated and presented as the "other" Carnegie group in this report.

Citizenship status. Most citizenship data are presented as reported by the doctorate recipients or as provided by the institutions that granted the doctorates. The following logical assumptions were made in certain situations:

- Ph.D.s who graduated in 1920–57 were assumed to be U.S. citizens if their baccalaureate institution was not foreign. This procedure was also used to impute citizenship status in this report's predecessor, *A Century of Doctorates: Data Analyses of Growth and Change* (NAS/NRC 1978).
- All Puerto Ricans were counted as U.S. citizens, as they legally hold U.S. citizenship.
- American Indians/Alaskan Natives who did not report their citizenship status were assumed to be U.S. citizens. Over the years, only a handful of American Indian Ph.D.s have reported themselves as citizens of Canada, Central America, or South America.
- Temporary visa status was assumed if citizenship status was missing but a foreign country of citizenship was reported.

Debt status and level. Included is debt that is directly related to the doctorate recipient's undergraduate and graduate education and is still owed at graduation. Education-related expenses include tuition and fees,

living expenses and supplies, and transportation to and from school.

Doctorate-granting institution. Any postsecondary institution in the United States that awards research doctorates (as defined below) and is accredited by an agency recognized by the Secretary of the U.S. Department of Education is a doctorate-granting institution.

Currently there are about 400 doctorate-granting institutions. The number can fluctuate from year to year for various reasons: (1) additional institutions become doctorate-granting, (2) some institutions with small programs do not award doctorates every year, and (3) a few institutions eliminate their doctoral programs altogether.

The institutions that awarded doctorates before 1920 (the first year of data in the DRF) were determined from annual reports of the U.S. Office of Education (USEO 1869–1916). The 1909 report, which provided summary data on earlier years, was used to definitively identify doctorate-granting institutions for the years up to 1909. The 1909 report excluded some institutions that had been included in earlier reports, presumably to correct for invalid information in prior years. Because some of the reported institutions had awarded very few doctorates and had done so sporadically, the list of pre-1920 awarding institutions was declared final only after a comparison with the early 1920s data in the DRF. Institutions that awarded doctorates in 1900–19 (according to Office of Education reports) and also in 1920–24 (according to the DRF) make up the pre-1920 list of doctorate-granting institutions. This group of institutions is discussed in chapter 5.

Employment commitment. Definite plans for any kind of employment other than a postdoctoral appointment for study or training are considered employment commitments. Military service counts as employment.

Field of doctorate. Field is the specialty field of doctoral degree as reported by the doctorate recipient or obtained from the institution's commencement program or graduation list.

There are about 280 fields on the SED Specialties List grouped under the following headings: agricultural sciences, biological sciences, computer and information sciences, education, engineering, health sciences, humanities (subdivided into history, letters, foreign languages and literature, and other humanities), mathematics, physical sciences (subdivided into astronomy, atmospheric science and meteorology, chemistry, geological and related sciences, physics, and miscellaneous physical sciences), professional fields (subdivided into business management and administrative services, communications, and other professional fields), psychology, and social sciences. The same list is used for reporting baccalaureate and master's degree fields as well as postdoctoral study and employment fields. The SED survey form and Specialties List can be found in appendix D of the annual *Doctorate Recipients from United States Universities: Summary Report* (NORC 1998–2002), which is available at http://www.norc.uchicago.edu/issues/docdata.htm.

This report categorizes the fields as science and engineering (S&E) or non-science and engineering (non-S&E) according to the scheme that NSF uses in its publications. Other agencies may classify the fields differently. The major difference between NSF's classification and those of other agencies is the exclusion of health fields from the S&E rubric; NSF places health fields within the non-S&E group, along with education, humanities, and professional fields. Other agencies include health fields with biological and agricultural sciences under the heading "life sciences" or with biological sciences alone under the heading "biomedical sciences."

Appendix A, table A-1, presents the number of doctorates awarded in each of the specialties, including those now obsolete, according to the NSF classification scheme. The table shows how fields have evolved over the years. Readers should be careful when interpreting time-series field data at the most disaggregated level. Specialties added over the years were reported in the general "other" category (e.g., other biological sciences) in earlier surveys or in a category that previously combined the new specialty with other specialties in the same general area (e.g., experimental/comparative/physiological psychology). The historical changes to the Specialties List are documented in *Science and Engineering Doctorates: 1960–91* (NSF 1993) and in the subsequent series *Science and Engineering Doctorate Awards* (NSF 1997–2002). The 1960–91 report is out of print, but information will be provided upon request (contact Susan Hill, director, Doctorate Data Project, at sthill@nsf.gov or 703-292-7790).

Historically Black Colleges and Universities (HBCUs). HBCUs are the 105 institutions founded between the post-Civil War Reconstruction period and 1963 for the express purpose of educating blacks. Fifteen HBCUs, led by Howard University, awarded doctorates during the 20th century. For a list of HBCUs, see http://www.ed.gov/about/inits/list/whhbcu/edlite-index.html.

Primary source of support. For the periods 1980–81 and 1996–97, primary source of support pertains to the entire time a student was in graduate school. For the period 1998–99, this item covers doctoral study only. The SED questions on sources of support have undergone several changes in recent years. For example, in 1998 the number of source categories was reduced from 35 to 13. Sources are no longer identified by specific provider (e.g., agency, foundation, kind of loan), because students do not always know the actual provider of their funding. Only the mechanism of support (e.g., fellowship, research assistantship, loan) is now captured. Most of the current categories are aggregates of multiple categories that were on previous questionnaires. For example, the new category "research assistantship" (RA) combines five earlier categories—university-related RA, National Institutes of Health RA, NSF RA, U.S. Department of Agriculture RA, and other RA. Three new categories were added in 1998: "dissertation grant," "internship or residency," and "personal savings."

For this report, the mapping scheme developed by the current SED contractor was used to tie earlier data to the new categories in the 1998–99 surveys. Pre-1998 federal support categories that do not specify a mechanism (e.g., Veterans Administration, National Endowment for the Humanities, other U.S. Department of Health and Human Services, other Education, other federal) are now included with the new fellowship/scholarship category.

Race/ethnicity. The SED race/ethnicity question has undergone several revisions. In 1977 it was modified to correspond to a standard question format recommended by the Federal Interagency Committee on Education and adopted by the Office of Management and Budget for use in federally sponsored surveys. In 1980 the item was further revised in two ways: (1) the Hispanic category was subdivided into "Puerto Rican," "Mexican," and "other Hispanic" to provide more detail for users of the racial/ethnic data; and (2) respondents were asked to check only one race/ethnicity category. In 1982 the item was recast as two questions to capture ethnicity and race separately. Since then, respondents have been asked to indicate whether or not they are Hispanic and then check one of four race categories (American Indian/Alaskan Native, Asian/Pacific Islander, black, or white). In accordance with the standard practice for reporting SED results, doctorate recipients who reported being Hispanic, regardless of racial designation, were counted as Hispanic in this report. The remaining survey respondents were counted in their respective racial groups.

Regions in the United States. The 50 U.S. states and the District of Columbia are grouped into four major regions, as defined by the U.S. Census Bureau, for the purpose of reporting doctorate production by region.

Northeast	Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont
Midwest	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, Wisconsin
South	Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, West Virginia
West	Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

Puerto Rico is reported separately.

Research doctorate. A research doctorate is any doctoral degree that (1) requires the completion of a dissertation or equivalent project of original work (e.g., musical composition) and (2) is not exclusively intended as a degree for the practice of a profession.

Although the most typical research doctorate is the Ph.D., more than 50 other kinds of degrees are covered in the SED. Not included in this definition are professional doctorates: Doctor of Medicine (M.D.), Doctor of Dental Surgery (D.D.S.), Doctor of Veterinary Medicine (D.V.M.), Doctor of Osteopathy (O.D.), Doctor of Pharmacy (Pharm.D.), Doctor of Psychology (Psy.D.), Juris Doctor (J.D.), and other similar degrees. For a complete listing of the kinds of research doctorates captured by the SED, see the inside of the back cover of the latest report in the annual *Doctorate Recipients from United States Universities: Summary Report*, which can be found at http://www.norc.uchicago.edu/issues/docdata.htm.

Sex. For most years since 1920, the doctorate recipient's sex was assumed to be male if not reported by the recipient or provided by the institution. The procedure was changed in 1991 to leave sex as missing if the information could not be obtained from the doctorate recipient or

the institution and if the recipient could not be assumed with great certainty to be male or female based on his or her name. There are 1,886 Ph.D.s of undetermined sex in the DRF, all but two of them graduates in the 1990s. These individuals are excluded from all percentages based on recipients' sex shown in this report.

The number of male and female Ph.D.s graduating in the period 1900 to 1919 was obtained from table 28 in *120 Years of American Education: A Statistical Portrait* (USED/NCES 1993). These data originally came from a series of annual reports published by the U.S. Office of Education (USEO 1869–1916) and a chapter in the *Biennial Survey of Education in the United States* (USEO 1918). Figures are not available for 1917 and 1919; data for those years were interpolated for the 1900 to 1999 trends shown in chapter 2.

Stay rate. Stay rate is the percentage of Ph.D.s with definite postgraduation plans who plan to stay in the United States.

The restriction on definite plans is necessary when examining long-term trends because, up to 1990, location was captured as part of "postdoctoral affiliation," which was generally completed by only those Ph.D.s with definite plans. In the 1990s the SED asked for location separately, resulting in more complete data on the intended locations of new Ph.D.s, whether or not they had commitments at graduation. The data from the 1990s show that a substantial number of non-U.S. citizens did not report commitments but did report intentions or aspirations to remain in the United States. Although there is no way to determine how many actually stayed on after graduation, it is fair to assume that a goodly number did. Table C-1 compares the 1995–99 aggregate data for non-U.S. citizens who reported definite postgraduation plans to stay in the United States (the population analyzed in chapter 6 and shown in table 6-2 and figures 6-8 and 6-9) with the corresponding data for all non-U.S. citizens who reported location, including those who did not have commitments at the time they completed the SED.

Study commitment. Definite plans involving a postdoctoral fellowship, research associateship, traineeship, or any other postdoctoral study or training supported by an organization or the doctorate recipient are considered study commitments.

Time to doctorate. This report includes three different measures of time to receipt of the doctorate, which are reported as medians. Half of all Ph.D.s take more time than the median to complete their doctorate, and half take less.

- *Total time to doctorate* (TTD) measures the total elapsed calendar time between receipt of the baccalaureate and receipt of the doctorate, including time not enrolled in school. TTD can be computed only if the baccalaureate year is known. Months are included in the calculation when available.

- *Registered time to doctorate* (RTD) measures the time in attendance at all colleges and universities between receipt of the baccalaureate and receipt of the doctorate, including enrollment not related to the doctoral program. RTD can be computed only if the doctorate recipient provides all years of attendance after receipt of the baccalaureate.

- *Postbaccalaureate time to doctorate* (PTD) measures the total elapsed calendar time between the first postbaccalaureate attendance at the

TABLE C-1. Non-U.S. citizens staying in the United States after graduation, by postgraduation status and region or selected country of citizenship: 1995–99, aggregate

	Definite plans		Any status	
Area	Number	Percent	Number	Percent
Region				
Americas	2,263	51.5	3,355	52.7
Europe	4,241	74.0	6,171	71.4
Africa	653	52.6	1,473	60.2
Asia	17,233	75.8	28,192	72.2
Australasia/Pacific	237	57.7	341	57.7
Selected country				
China (PRC)	7,548	96.5	12,459	95.5
India	4,018	93.0	5,762	90.7
Taiwan	1,734	58.8	3,245	54.2
Korea	1,405	57.1	2,402	44.4
Canada	983	60.3	1,402	60.7
Germany	607	68.7	882	67.5
Great Britain	542	82.0	760	79.2
Russia	491	90.9	669	89.8
Japan [a]	339	46.4	530	47.5
Turkey [a]	318	57.6	518	57.9
Iran [a]	289	90.6	550	88.1

[a] Iran ranks higher numerically than Japan and Turkey when both definite and indefinite plans are included, but it ranks lower when only definite plans are counted.

NOTE: Percentages are based on the total number of non-U.S. citizen Ph.D.s with known postgraduation location.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

institution that awarded the doctorate and receipt of the doctorate. PTD includes time spent in a master's degree program if these studies were at the same institution that granted the doctorate.

Year of doctorate. The SED collects data for the academic year, which begins on 1 July of one calendar year and ends on 30 June of the next year. Academic years are identified in reports by the calendar year in which they end. For example, data reported as 1999 include all graduations from 1 July 1998 through 30 June 1999. Graduations that took place in the last six months of calendar year 1999 were part of the 2000 SED and are not included in this report.

The data for graduations from 1920 through 1957 were obtained from public sources, such as commencement programs, and were recorded in the DRF by calendar year. Because the second half of calendar year 1957 is part of the 1958 SED, an adjustment is required to make both years represent a full 12 months in tabulations. The standard procedure is to double-count the number of doctorates awarded in the last half of calendar year 1957. This six-month period was counted once in calendar year 1957 and once in academic year 1958 (the SED data collection period) for this report, but only for trends showing the 1950s as one or more data points. The total number of doctorates awarded in 1900–99 or 1920–99 reflects the actual number of doctorates awarded in those years, that is, with no double-counting of the number of doctorates awarded in the last six months of calendar year 1957.

Data Sources

The doctoral data in this report came from two original sources: U.S. Office of Education annual and biennial reports for the years 1900 to 1919, and the Doctorate Records File for the years 1920 to 1999 (including the results of the Survey of Earned Doctorates for the years 1958 to 1999).

U.S. Office of Education Reports

Data on the number of doctorates awarded from 1900 to 1919, in total and by sex, were obtained from *120 Years of American Education: A Statistical Portrait* (USED/NCES 1993). These data came originally from a series of annual reports published by the U.S. Office of Education (USEO 1869–1916) and a chapter in the *Biennial Survey of Education in the United States* (USEO 1918). Figures are not available for 1917 and 1919.

Chapter 5 examines the role of institutions that awarded doctorates before 1920. The pre-1920 group of institutions was determined from the Office of Education reports. The 1909 report presented summary data for the years 1878–1909, excluding some institutions that had appeared in earlier reports. The assumption is that it was correcting for invalid data published previously. The 1909 report was used as the definitive source of doctorate-granting institutions up to 1909.

Doctorate Records File and Survey of Earned Doctorates

The Doctorate Records File (DRF) is a virtually complete data bank on more than 1.35 million doctorate recipients. For the years 1920–57, public sources, such as commencement programs and institution lists, provided limited information, mainly baccalaureate institution and year; doctoral institution, field, and year; and sex of recipient (which, if not obtained from the institution, was coded based on the recipient's name).

The DRF also houses the results of the Survey of Earned Doctorates (SED), an annual census of new doctorate recipients that has been conducted since the 1957–58 academic year (referred to as 1958 in published reports). The SED is sponsored by six federal agencies: the National Science Foundation (lead sponsor), the National Aeronautics and Space Administration, the National Endowment for the Humanities, the National Institutes of Health, the U.S. Department of Agriculture, and the U.S. Department of Education. The DRF also serves as the sampling frame for the biennial Survey of Doctorate Recipients, a longitudinal survey of science, engineering, and (in some years) humanities Ph.D.s who are employed in the United States.

Every year, the SED is distributed to all accredited colleges and universities that grant research doctorates (about 400). A few institutions refuse to participate, but it is known from the National Center for Education Statistics/U.S. Department of Education's Integrated Postsecondary Education Data System (IPEDS) Completions Survey that these institutions contribute minimally to the overall population of doctorates. The Completions Survey collects basic information on doctoral degrees from the institutions rather than from individual doctorate recipients.

Since 1994 more than 40,000 doctorates have been awarded annually. The annual numbers of doctorates reported in the results of the IPEDS Completions Survey

are slightly higher than those in the SED. Differences can be attributed largely to the inclusion of nonresearch doctorates, primarily in the fields of theology and education, in the Completions Survey. The differences between the two surveys were fairly consistent from 1960 to 1999, with ratios of IPEDS-to-SED counts ranging from 1.01 to 1.06. Because a respondent to the SED may not classify his or her specialty exactly as reported by the institution in the Completions Survey, the difference in the number of doctorates for a given field reported by the two surveys may be greater than the difference for all fields combined.

The SED covers about 50 kinds of research doctorates. Most recipients earn the Ph.D. degree (85–89 percent annually since 1973, when kind of degree was first tracked). The Doctor of Education (Ed.D.) is the second most common degree, received by 7–11 percent of doctorate recipients each year from 1973 to 1999. Professional doctorates, including those in medicine, law, dentistry, veterinary medicine, osteopathy, and psychology, are not covered in the SED. The kind of professional doctorate and year of receipt, however, are captured for recipients of research doctorates who earned professional doctorates either before the research doctorate or concurrently.

Because the DRF is a census of individuals rather than degrees, only the first doctorate is entered into the database. Every year, the names and social security numbers of new doctorate recipients are compared with the same information on all earlier DRF records to ensure that there are no duplications in the database. Any records of second (or third) doctorates earned by a recipient are removed from the DRF, but hard copies of the survey forms for additional doctorates are retained. Data on predoctoral degrees of doctorate recipients also reflect the first degree at each level.

The SED cycle includes all graduations during the academic year (1 July to 30 June) and is identified by the year in which the cycle ends. Thus the 1999 SED collected data from doctorate recipients who graduated between 1 July 1998 and 30 June 1999. The graduate schools distribute the SED forms to students, who then complete the surveys and return them to the SED coordinator at their institution for transmittal to the survey contractor. Since 1997 the National Opinion Research Center of the University of Chicago has administered the SED for the sponsoring federal agencies. The National Research Council of the National Academy of Sciences administered the SED from its inception, in 1958, through the 1996 cycle.

Doctorate recipients provide information about their demographic characteristics, educational history from high school to doctorate, sources of financial support in graduate school (or in the doctoral program), debt status at graduation, and immediate postgraduation plans. Thanks to the cooperation of the graduate schools and the extremely high participation rates of doctoral graduates, the DRF is the richest source of doctoral data in the nation. Government agencies, academic institutions, and industry use the SED results to address a wide range of policy, education, and human resource issues. The authors of this report have strived to showcase the wealth of available data by presenting long-term trends when possible, and recent data when not, for nearly every variable in the DRF. More than 500 tables were generated, reviewed, and analyzed for this project, and data from many are displayed in figures and tables within the report. As a supplement to the printed volume, detailed trend tables showing doctoral awards by field of doctorate and by state and institution, baccalaureate institutions of Ph.D.s, and country of citizenship of non-U.S. citizen doctorate recipients, by visa status, are available on the NSF website at http://www.nsf.gov/statistics/nsf06319/.

Response Rates

The SED has enjoyed excellent response rates throughout its more than 40-year history. Both unit and item response rates have been very high and relatively stable since the first survey, in 1958.

Basic information on nonrespondents can be obtained from institutions or commencement programs, so records exist for all doctorate recipients. However, response to the SED is measured by the percentage of doctorate recipients who complete the surveys themselves (*self-report rate*), thereby providing details that are not available from any other source. The SED's goal is a stable self-report rate of 94–95 percent. This rate was achieved or surpassed in all but 9 of the 42 surveys processed between 1958 and 1999. The self-report rate dropped below target for the first time in 1986 and stayed below target through 1990. The 1991–95 surveys achieved the target level, but the self-report rate declined again in 1996–99. A little less than 92 percent of all doctorate recipients completed the survey in the last three surveys of the century, 1997–99.

Because records are constructed from public information for Ph.D.s who do not complete the SED questionnaire, certain items are available for all doctorate recipients: name, doctoral institution, field of doctorate, month and year of graduation, and kind of doctorate. The institution

provides this information in its commencement program or graduation list.

A 95 percent item-response-rate target is set for eight critical items: date of birth, sex, citizenship, country of citizenship (for non-U.S. citizens), race/ethnicity, baccalaureate institution, baccalaureate year, and postdoctoral location. If missing, these items are followed up through letters to self-reporting respondents or, for Ph.D.s who did not complete questionnaires, through requests to institutions. The response rates for these items often exceed the overall self-report rate for the survey because of institutional responses and information on baccalaureate degrees available from commencement programs. Rigorous follow-up on critical items has been conducted since 1990. Follow-up requests for race/ethnicity, postdoctoral location, and country of citizenship (if foreign) were made for the first time in the 1990 SED, increasing the completeness of these items from that time forward. From 1990 to 1996, all critical items except postdoctoral location surpassed the 95 percent target. Response for every critical item except sex and foreign country of citizenship fell below target during subsequent years with transfer of the administration of the SED to a new contractor.

The target item response rate for all noncritical survey items is 90 percent. During much of the 1990s, most noncritical items either met or were within 2 percentage points of the target response rate. Fewer items attained a 90 percent response rate during the contractor transition period. Five noncritical items, if missing, are added to the follow-up requests for Ph.D.s missing critical items: birthplace, high school graduation year, high school location, master's degree institution, and year of master's degree. Throughout the SED's history, a few items have had, and will continue to have, lower response rates because they are not applicable to all individuals (e.g., master's degree information), or because they seem complex or confusing to some doctorate recipients (e.g., timelines from college entrance to doctoral graduation, sources of support).

Some items with below-target response rates in the first half of the 1990s surpassed the target in 1996, when the questionnaire was reformatted to be more respondent-friendly. Two items are particularly relevant to this report: (1) primary source of support, in which the 1996 response rate was 13.0 percentage points higher than in the previous survey, and (2) primary work activity after graduation, in which the response rate rose 6.5 percentage points. Moreover, response to these items held steady or increased during the transfer of the SED to a new contractor, despite a decrease in the overall self-report rate for the SED and decreases in response rates for many other items.

Although both unit and item response rates in the SED have been relatively stable through the years, fluctuations can affect data comparability. This is especially true for the items on citizenship and race/ethnicity, for which very small fluctuations in response may result in increases or decreases in counts that do not reflect actual trends. The percentages shown in the figures and tables in this report are based only on the number of doctorate recipients who responded to the applicable survey items (including some logical assumptions based on other items, as explained in the section "Definitions and Explanations") or for whom information was obtained from a public source. The overall response rate for any cross-tabulation of data is no greater than the lowest response rate for the items involved in the tabulation.

Table C-2 shows the nonresponse rates for the items analyzed in this report and displayed in figures and tables. For items covering a long time span, the overall nonresponse rate for the entire period is given, even though the data may be displayed annually or in 5-year periods in figures and tables. For items that are analyzed for only two or three select time periods, the nonresponse rate for each period is given.

Availability of SED Data

Results of the SED are published annually in *Doctorate Recipients from United States Universities: Summary Report* (NAS/NRC 1968–98, NORC 1998–2002), which covers doctorates in all specialty fields, and in *Science and Engineering Doctorate Awards*, which focuses primarily on science and engineering doctorates. Recent *Summary Reports* are available at http://www.norc.uchicago.edu/issues/docdata.htm. The *Science and Engineering Doctorate Awards* series (NSF 1997–2002) is available on the NSF website at http://www.nsf.gov/statistics/nsf06319/.

Information from the survey is included in several other report series published by NSF: *Science and Engineering Degrees; Science and Engineering Indicators; Women, Minorities, and Persons With Disabilities in Science and Engineering,* and in special reports published periodically, such as *Undergraduate Origins of Recent Science and Engineering Doctorate Recipients*.

TABLE C-2. Item nonresponse rates in Doctorate Records File

Item	Relevant chapter	Period covered	Nonresponse rate	Comment
Demographic characteristics				
Age	3	1960–99	3.1	Computed variable. Nonresponse indicates missing birth year.
Citizenship status	All	1920–99	3.0	1920–57 are imputed based on location of BA institution (0.7% missing BA location in those years); 1958–99 are SED results.
Country of citizenship for foreign Ph.D.s	3, 6	1960–99	7.6	
Disability status	3	1993–99	8.2	
Father's education	3	1965–99	9.0	
Sex	All	1920–99	0.1	1,886 cases (mostly in 1991–99) are missing sex.
		1960–99	3.3	SED results only.
Marital status	3	1960–99	6.2	
Marital status and dependents	3	1960–64	13.7	Missing either item.
		1995–99	12.2	Missing either item.
Parents' education	3	1965–99	8.6	Missing for both parents.
Mother's education	3	1965–99	9.3	
Race/ethnicity, all Ph.D.s	3	1975–99	6.6	
Race/ethnicity, U.S. citizens	2–5	1975–99	2.7	
Race/ethnicity, U.S citizens and permanent residents	6	1975–99	2.8	
Education				
Attendance at 2-year college	4	1971–74	3.1	
		1995–99	8.4	
Baccalaureate field	4	1960–99	7.6	Excludes 8,742 cases in 1969–99 known to have no BA (0.7% of 1960–99 total).
Baccalaureate institution and location	4, 5	1920–99	2.5	Excludes 8,742 cases in 1969–99 known to have no BA (0.7% of 1960–99 total).
Carnegie Classification of doctoral institution	5, 6	1990–99	0.0	93 cases in 1990–99 are missing Carnegie classifications because they were not assigned a Carnegie code.
Control of U.S. baccalaureate institution	5	1920–24	1.8	Excludes 114 cases in 1900–24 with no BA information.
		1995–99	1.2	Excludes 2,003 cases in 1995–99 known to have no BA.
Control of U.S. doctoral institution	2, 5	1920–99	0.0	
Debt status and debt level	4	1988–89	8.7	Another 0.3% reported status but not level.
Doctoral field	All	1920–99	0.0	13 cases in 1997–98 are missing field. They are grouped with "professional fields/other" in this report.
Doctoral institution and location	2, 5, 6	1920–99	0.0	
Master's institution and location	4	1960–99	19.5	Excludes 23,183 cases in 1993–99 known to have no MA (1.9% of 1960–99 total; 8.0% of 1993–99 total). If "no MA" had been captured in earlier years, actual nonresponse for this item each year would probably have been 10%–14%.
Master's field	4	1960–99	23.7	Excludes 23,183 cases in 1993–99 known to have no MA (1.9% of 1960–99 total; 8.0% of 1993–99 total). If "no MA" had been captured in earlier years, actual nonresponse for this item each year would probably have been 11%–17%.
Postbaccalaureate time to doctorate	4	1995–99	16.6	Computed variable. Nonresponse indicates missing year of first post-BA entrance in Ph.D.-granting institution.
Primary source of support, all graduate study	4	1980–81	11.0	
		1996–97	13.7	
Primary source of support, doctoral study	4	1998–99	10.8	
		1993–99	8.8	
		1995–99	9.4	
Registered time to doctorate	4	1960–99	13.6	Computed variable. Enrollment dates are required for all institutions attended. Nonresponse indicates one or more missing enrollment dates.

TABLE C-2. Item nonresponse rates in Doctorate Records File

Item	Relevant chapter	Period covered	Nonresponse rate	Comment
Status in year before doctorate	4	1970–74	5.3	
Total time to doctorate	4	1920–99	3.7	Computed variable. Nonresponse indicates missing BA year.
Year of doctorate	All	1920–99	0.0	
Postgraduation plans				
Commitment status	6	1970–99	7.4	
U.S. or foreign commitment location	6	1970–99	3.3	
Study or employment U.S. commitment	6	1970–99	0.6	
Study commitments				
Mechanism	6	1970–74	0.0	Must be present to count as study commitment.
		1995–99	0.0	Must be present to count as study commitment.
Source of support	6	1975–79	6.1	Another 6.5% marked the survey category for "unknown source."
		1995–99	3.2	Another 8.1% marked the survey category for "unknown source."
Setting	6	1970–74	1.0	
		1995–96	13.4	
Employment commitments				
Sector	6	1970–99	0.7	
Primary work activity	6	1970–74	3.3	
		1995–99	4.7	
Interstate migration	6	1970–74	< 0.1	
		1995–99	1.9	

BA = bachelor's degree; MA = master's degree; Ph.D. = doctoral degree; SED = Survey of Earned Doctorates.

SOURCE: NSF/NIH/USED/NEH/USDA/NASA, Survey of Earned Doctorates and Doctorate Records File.

Selected summary data from this survey are available on the NSF website noted above, and in the WebCASPAR database, which can also be accessed through the NSF website. Researchers interested in analyzing microdata may request access to restricted data through a licensing agreement with NSF. For more information about this survey, contact Susan Hill at sthill@nsf.gov or 703-292-7790.

REFERENCES

National Academy of Sciences, National Research Council (NAS/NRC). 1968–98. *Summary Report 1967…1996: Doctorate Recipients from United States Universities*. Annual series of survey results from the Survey of Earned Doctorates, conducted by NAS/NRC under sponsorship of the National Science Foundation, National Institutes of Health, National Endowment for the Humanities, U.S. Department of Education, and U.S. Department of Agriculture. Washington, DC.

National Academy of Sciences, National Research Council (NAS/NRC). 1978. *A Century of Doctorates: Data Analyses of Growth and Change*. Prepared by L.R. Harmon. Washington, DC.

National Opinion Research Center (NORC). 1998–2002. *Doctorate Recipients from United States Universities: Summary Report 1997…2001*. Annual series of survey results from the Survey of Earned Doctorates, conducted by NORC for the National Science Foundation, National Institutes of Health, National Endowment for the Humanities, U.S. Department of Education, U.S. Department of Agriculture, and National Aeronautics and Space Administration. Chicago.

National Science Foundation (NSF). 1993. *Science and Engineering Doctorates: 1960–91*. NSF 93-301. Washington, DC.

National Science Foundation (NSF). 1997–2002. *Science and Engineering Doctorate Awards: 1996…2001*. Annual series. Arlington, VA.

U.S. Department of Education, National Center for Education Statistics (USED/NCES). 1993. *120 Years of American Education: A Statistical Portrait*. Washington, DC.

U.S. Office of Education (USEO). 1869–1916. *Annual Report of the United States Commissioner of Education.* Washington, DC: U.S. Government Printing Office.

U.S. Office of Education (USEO). 1918. *Biennial Survey of Education in the United States.* Washington, DC: U.S. Government Printing Office.

BIBLIOGRAPHY

Adkins, D.L. 1975. *The Great American Degree Machine: An Economic Analysis of the Human Resource Output of Higher Education*. Berkeley: Carnegie Commission on Higher Education.

Association of American Universities. 2003. The Letter of Invitation to the Founding Conference of AAU. http://www.aau.edu/aau/Invit.html. Accessed April 2005.

Axt, R.G. 1959. *Research on Graduate Education: Report of a Conference*. Washington, DC: Brookings Institution Press.

Ben-David, J. 1972. *American Higher Education: Directions Old and New.* New York: McGraw-Hill.

Ben-David, J. 1974. *Trends in American Higher Education*. Chicago: University of Chicago Press.

Ben-David, J. 1977. *Centers of Learning: Britain, France, Germany, United States*. New York: McGraw-Hill.

Berelson, B. 1960. *Graduate Education in the United States*. New York: McGraw-Hill.

Blank, D.M., and G.J. Stigler. 1957. *The Demand and Supply of Scientific Personnel.* New York: National Bureau of Economic Research.

Bledstein, B.J. 1976. *The Culture of Professionalism: The Middle Class and the Development of Higher Education in America.* New York: W.W. Norton.

Bond, H.M. 1972. *Black American Scholars*. Detroit: Balamp Publishing.

Bowen, W.G., and N.L. Rudenstine. 1992. *In Pursuit of the PhD*. Princeton: Princeton University Press.

Bowen, W.G., and J.A. Sosa. 1989. *Prospects for Faculty in the Arts and Sciences: A Study of Factors Affecting Demand and Supply, 1987–2012*. Princeton: Princeton University Press.

Bowman, I. 1939. The graduate school in American democracy. *U.S. Office of Education Bulletin No. 10.* Washington, DC: U.S. Government Printing Office.

Brazziel, M.E., and W.F. Brazziel. 1981. *Baccalaureate Origins of Black Doctorate Recipients: Listings of Baccalaureate Colleges and Universities 1975–80*. Mansfield Center, CT: Marian Brazziel Associates.

Breneman, D.W. 1975. *Graduate School Adjustments to the "New Depression" in Higher Education.* Technical Report No. 3. Washington, DC: National Board on Graduate Education.

Brodie, J.M. 1992. $29.3 million NSF program targets minority science increase. *Black Issues in Higher Education* January: 34.

Brown, M.C. 2000. *The Faces of Science: African Americans in the Sciences.* http://www.princeton. edu/~mcbrown/display/bouchet. Accessed April 2005.

Bruce, R.V. 1987. *The Launching of Modern American Science: 1846–1876*. New York: Alfred A. Knopf.

Bryant, J.W. 1969. *A Survey of Black American Doctorates.* New York: Ford Foundation.

Buchanan, A.L., and Jean-Pierre V.M. Hérubel. 1995. *The Doctor of Philosophy Degree: A Selective, Annotated Bibliography.* Westport, CT: Greenwood Press.

Burg, J.C. 1917. The doctorates of philosophy conferred by American universities. *School and Society* 5 (February 3): 145–9.

Caplow, T., and R.J. McGee. 1958. *The Academic Marketplace*. New York: Basic Books.

Carmichael, O.C. 1961. *Graduate Education: A Critique and a Program*. New York: Harper.

Carnegie Foundation for the Advancement of Teaching. 1994. *A Classification of Institutions of Higher Education.* Princeton, NJ.

Cattell, J.M. 1907. Doctorates conferred by universities. *Science* 26 (August 30): 276–82.

Cattell, J.M. 1912. Doctorates conferred by universities. *Science* 36 (August 2): 129–39.

Cattell, J.M. 1914. Doctorates conferred by universities. *Science* 40 (August 21): 256–64.

Cattell, J.M. 1915. Doctorates conferred by universities. *Science* 42 (October 22): 555–65.

Cattell, J.M. 1927. The origin and distribution of scientific men. *Science* 66 (November 25): 513–6.

Cattell, J.M. 1937. The sixth edition of the biographical directory of American Men of Science. *Science* 85 (March 12): 264–7.

Clark, B.R., ed. 1993. *The Research Foundations of Graduate Education: Germany, Britain, France, United States, Japan*. Berkeley: University of California Press.

Commission on Human Resources and Advanced Training. 1954. *America's Resources of Specialized Talent: A Current Appraisal and a Look Ahead*. Prepared by D. Wolfle. New York: Harper.

Council of Graduate Schools. 1990. *The Doctor of Philosophy Degree: A Policy Statement*. Washington, DC.

Derby, G., comp. *The National Cyclopaedia of American Biography.* 1906. New York: J.T. White and Company.

DeVane, W.C. 1965. *Higher Education in Twentieth-Century America*. Cambridge, MA: Harvard University Press.

Dresch, S.P. 1974. *An Economic Perspective on the Evolution of Graduate Education*. Technical Report No. 1. Washington, DC: National Board on Graduate Education.

Drew, D.E. 1975. *Science Development: An Evaluation Study*. Technical Report No. 4. Washington, DC: National Board on Graduate Education.

Ehrenberg, R.G. 1992. The flow of new doctorates. *Journal of Economic Literature* 30 (June): 830–75.

Eisenmann, L., ed. 1998. *Historical Dictionary of Women's Education in the United States.* Westport, CT: Greenwood Press.

Espenshade, T.J., and G. Rodriguez. 1997. Completing the Ph.D.: Comparative performances of U.S. and foreign students. *University of Texas/Social Science Quarterly* 72(2):593–605.

Finn, M.G. 1997. *Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 1995.* Oak Ridge, TN: Oak Ridge Institute for Science and Education.

Finn, M.G. 2000. *Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 1997*. http://www.orau.gov/orise/pubs/stayrate00.pdf. Accessed 31 March 2003.

Finn, M.G. 2001. *Stay Rates of Foreign Doctorate Recipients from U.S. Universities, 1999*. http://www.orau.gov/orise/pubs/stayrate01.pdf. Accessed 31 March 2003.

Flexner, A. 1910. Medical education in the United States and Canada. Bulletin No. 4. New York: Carnegie Foundation for the Advancement of Teaching.

Flexner, A. 1930. *Universities: American, English, German*. New York: Oxford University Press.

Folger, J.K., H.S. Astin, and A.E. Bayer. 1970. *Human Resources and Higher Education: Staff Report of the Commission on Human Resources and Advanced Education.* New York: Russell Sage Foundation.

Franklin & Marshall College. 1995. *Baccalaureate Origins of Doctorate Recipients: A Ranking by Discipline of 4-Year Private Institutions, 8th Edition, 1920–1992 Data*. Lancaster, PA.

Freeman, R., and D.W. Breneman. 1974. *Forecasting the Ph.D. Labor Market: Pitfalls for Policy*. Technical Report No. 2. Washington, DC: National Board on Graduate Education.

Garraty, J.A., and M.C. Carnes, eds. 1999. *American National Biography.* Vols. 19 and 24. New York: Oxford University Press.

Geiger, R.L. 1986. *To Advance Knowledge: The Growth of American Research Universities, 1900–1940.* New York: Oxford University Press.

Geiger, R.L. 1993a. *Research and Relevant Knowledge: American Research Universities Since World War II*. New York: Oxford University Press.

Geiger, R.L. 1993b. Research, graduate education, and the ecology of American universities: An interpretive history. In S. Rothblatt and B. Wittrock, eds., *The European and American University Since 1800: Historical and Sociological Essays*, pp. 234–59. New York: Cambridge University Press.

Geiger, R.L. 1999. The ten generations of American higher education. In P.G. Altbach, R.O. Berdahl, and P.J. Gumport, eds., *American Higher Education in the 21st Century: Social, Political, and Economic Challenges*, pp. 38–69. Baltimore: Johns Hopkins University Press.

Geiger, R.L., ed. 2000. *The American College in the Nineteenth Century*. Nashville: Vanderbilt University Press.

Goldin, C., and L.F. Katz. 1999. The shaping of higher education: The formative years in the United States, 1890 to 1940. *Journal of Economic Perspectives* 13 (winter): 37–62.

Greene, H.W. 1946. *Holders of Doctorates Among American Negroes: An Educational and Social Study of Negroes Who Have Earned Doctoral Degrees in Course, 1876–1943.* Boston: Meador Publishing Co.

Gumport, P.J. 1993a. Graduate education and organized research in the United States. In B.R. Clark, ed., *The Research Foundations of Graduate Education: Germany, Britain, France, United States, Japan*, pp. 225–60. Berkeley: University of California Press.

Gumport, P.J. 1993b. Graduate education and research imperatives: Views from American campuses. In B.R. Clark, ed., *The Research Foundations of Graduate Education: Germany, Britain, France, United States, Japan*, pp. 261–93. Berkeley: University of California Press.

Guralnick, S.M. 1979. The American scientist in higher education, 1820–1910. In N. Reingold, ed., *The Sciences in the American Context: New Perspectives*, pp. 99–141. Washington, DC: Smithsonian Institution Press.

Haggerty, M.E. 1928. Occupational destination of Ph.D. recipients. *Educational Record* 9 (October): 209–91.

Hawkins, H. 1992. *Banding Together: The Rise of National Associations in American Higher Education, 1887–1950*. Baltimore: Johns Hopkins University Press.

Hofstadter, R., and C.D. Hardy. 1952. *The Development and Scope of Higher Education in the United States*. New York: Columbia University Press.

Hollis, E.V. 1945. *Toward Improving Ph.D. Programs*. Report prepared for the Commission on Teacher Education. Washington, DC: American Council on Education.

Horton, C. 1988. *The Black Doctorate*. New York: University Press of America.

Hughes, R.M. 1925. *A Study of Graduate Schools of America*. Oxford, OH: Miami University.

Hughes, R.M. 1946. *A Study of American Graduate Schools Conferring the Doctorate, 1937–38 to 1941–42.* Ames, IA: Iowa State University Press.

Ibarra, R.A. 1996. *Latino Experiences in Graduate Education: Implications for Change*. Washington, DC: Council of Graduate Schools.

Institute of International Education. 1955–2002. *Open Doors 1954/55… 2002: Report on International Educational Exchange*. Annual series. New York. http://opendoors.iienetwork.org. Accessed April 2005.

James, W. 1918. The Ph.D. octopus. *Educational Review* 55:149–57.

Jaurausch, K., ed. 1983. *The Transformation of Higher Learning, 1860–1930: Expansion, Diversification, Social Opening, and Professionalization in England, Germany, Russia, and the United States*. Chicago: University of Chicago Press.

Jay, J.M. 1971. *Negroes in Science: Natural Science Doctorates, 1876–1969*. Detroit: Balamp Publishing.

Jencks, C., and D. Riesman. 1968. *The Academic Revolution*. Garden City, NY: Doubleday.

John, W.C. 1935. Graduate study in universities and colleges in the United States. U.S. Office of Education Bulletin No. 20. Washington, DC: U.S. Government Printing Office.

Judge, H. 1982. *American Graduate Schools of Education: A View From Abroad*. Report to the Ford Foundation. New York: Ford Foundation.

Kane, J.N., S. Anzovin, and J. Podell. 1997. *Famous First Facts: A Record of First Happenings, Discoveries, and Inventions in American History.* 5th ed. New York: H.W. Wilson Company.

Kidd, C.V. 1959. *American Universities and Federal Research Funds*. Cambridge, MA: Belknap Press.

Knapp, R.H., and H.B. Goodrich. 1952. *Origins of American Scientists*. Chicago: University of Chicago Press.

Kohler, R.E. 1990. The Ph.D. machine: Building on the collegiate base. *Isis* 81:638–62.

Malone, D., ed. 1935. *Dictionary of American Biography.* Vol. 8. New York: Charles Scribner's Sons.

Malone, D., ed. 1936. *Dictionary of American Biography.* Vol. 10. New York: Charles Scribner's Sons.

National Academy of Sciences, National Research Council. 1948. *Baccalaureate Origins of the Science Doctorates Awarded in the United States 1936–1945.* Washington, DC.

National Academy of Sciences, National Research Council. 1955. *Baccalaureate Origins of Science Doctorates Awarded in the United States 1936–1950.* NAS Publication No. 382. Washington, DC.

National Academy of Sciences, National Research Council. 1956. *Baccalaureate Origins of Doctorates in the Arts, Humanities, and Social Sciences Awarded in the United States 1936–1950*. NAS Publication No. 460. Washington, DC.

National Academy of Sciences, National Research Council. 1958. *Doctorate Production in United States Universities, 1936–1956, with Baccalaureate Origins of Doctorates in Sciences, Arts, and Humanities.* NAS Publication No. 582. Washington, DC.

National Academy of Sciences, National Research Council. 1961. *The High School Background of Science Doctorates*. Prepared by L.R. Harmon. Scientific Manpower Report No. 3 to the National Science Foundation. Washington, DC.

National Academy of Sciences, National Research Council. 1963. *Doctorate Production in United States Universities 1920–1962, with Baccalaureate Origins of Doctorates in Sciences, Arts, and Professions.* NAS Publication No. 1142. Washington, DC.

National Academy of Sciences, National Research Council. 1964. *A Multiple Discriminant Analysis of the High School Background Data for the Doctorates of 1958.* Prepared by L.R. Harmon. Scientific Manpower Report No. 4 to the National Science Foundation. Washington, DC.

National Academy of Sciences, National Research Council. 1965a. *High School Ability Patterns: A Backward Look From the Doctorate.* Prepared by L.R. Harmon. Washington, DC.

National Academy of Sciences, National Research Council. 1965b. *Profiles of PhD's in the Sciences: Summary Report on Follow-up of Doctorate Cohorts 1935–1960.* NAS Publication No. 1293. Washington, DC.

National Academy of Sciences, National Research Council. 1967. *Doctorate Recipients From United States Universities, 1958–1966*. NAS Publication No. 1489. Washington, DC.

National Academy of Sciences, National Research Council. 1968a. *The Backgrounds and Early Careers of Engineering Doctorate Recipients*. Prepared by J.G. Creager. A report to the Ford Foundation. Washington, DC.

National Academy of Sciences, National Research Council. 1968b. *Careers of PhD's, Academic Versus Nonacademic: A Second Report on Follow-up of Doctoral Cohorts, 1935–1960.* NAS Publication No. 1577. Washington, DC.

National Academy of Sciences, National Research Council (NAS/NRC). 1968–98. *Summary Report 1967…1996: Doctorate Recipients from United States Universities.* Annual series of survey results from the Survey of Earned Doctorates, conducted by NAS/NRC under sponsorship of the National Science Foundation, National Institutes of Health, National Endowment for the Humanities, U.S. Department of Education, and U.S. Department of Agriculture. Washington, DC.

National Academy of Sciences, National Research Council. 1969. *The Invisible University: Postdoctoral Education in the United States.* Prepared by R.B. Curtis. Washington, DC.

National Academy of Sciences, National Research Council. 1970. *The Ford Foundation Forgivable Loans in Support of Graduate Education in Engineering: A Program Evaluation*. Prepared by L R. Harmon. A report to the Ford Foundation. Washington, DC.

National Academy of Sciences, National Research Council. 1971. *Mobility of PhD's Before and After the Doctorate, with Associated Economic and Educational Characteristics of States.* NAS Publication No. 1874. Washington, DC.

National Academy of Sciences, National Research Council. 1974. *Postdoctoral Training in the Biomedical Sciences: An Evaluation of NIGMS Postdoctoral Traineeship and Fellowship Programs.* Washington, DC.

National Academy of Sciences, National Research Council. 1974–98. *Doctoral Scientists and Engineers in the United States: 1973…1995 Profile*. Biennial series from the Survey of Doctorate Recipients. Washington, DC.

National Academy of Sciences, National Research Council. 1975a. *Field Mobility of Doctoral Scientists and Engineers.* Washington, DC.

National Academy of Sciences, National Research Council. 1975b. *Minority Groups Among United States Doctorate Level Scientists, Engineers, and Scholars, 1973*. Washington, DC.

National Academy of Sciences, National Research Council. 1976a. *Employment Status of Ph.D. Scientists and Engineers, 1973 and 1975.* Washington, DC.

National Academy of Sciences, National Research Council. 1976b. *An Evaluation of the 1973 Survey of Doctoral Scientists and Engineers.* Washington, DC.

National Academy of Sciences, National Research Council. 1976c. *Research Training and Career Patterns of Bioscientists: The Training Programs of the National Institutes of Health.* Washington, DC.

National Academy of Sciences, National Research Council. 1978. *A Century of Doctorates: Data Analyses of Growth and Change*. Prepared by L.R. Harmon. Washington, DC.

National Academy of Sciences, National Research Council. 1979. *Career Patterns of Doctoral Scientists and Engineers: 1973–1977.* An analytical study prepared by L.R. Harmon for the National Science Foundation. Washington, DC.

National Academy of Sciences, National Research Council. 1982. *An Assessment of Research-Doctorate Programs in the United States*. L.V. Jones, G. Lindzey, and P.E. Coggeshall, eds. Washington, DC.

National Academy of Sciences, National Research Council. 1983. *Climbing the Ladder: An Update on the Status of Doctoral Women Scientists and Engineers*. Prepared by the Committee on the Education and Employment of Women in Science and Engineering, Office of Scientific and Engineering Personnel. Washington, DC.

National Academy of Sciences, National Research Council. 1986–97. *Humanities Doctorates in the United States: 1985…1995 Profile*. Biennial series. Washington, DC.

National Academy of Sciences, National Research Council. 1990. *On Time to the Doctorate: A Study of the Increased Time to Complete Doctorates in Science and Engineering*. Prepared by H. Tuckman, S. Coyle, and Y. Bae. Washington, DC.

National Academy of Sciences, National Research Council. 1995a. *Research-Doctorate Programs in the United States: Continuity and Change*. M.L. Goldberger, B.A. Maher, and P.E. Flattau, eds. Washington, DC.

National Academy of Sciences, National Research Council. 1995b. *Reshaping the Graduate Education of Scientists and Engineers*. Washington, DC.

National Academy of Sciences, National Research Council. 1996. *The Path to the Ph.D.: Measuring Graduate Attrition in the Sciences and Humanities*. Prepared by the Ad Hoc Panel on Graduate Attrition Advisory Committee. Washington, DC.

National Academy of Sciences, National Research Council. 2000. *Addressing the Nation's Changing Needs for Biomedical and Behavioral Scientists*. Series. Washington, DC. [Earlier reports in the series were published under different titles: 1975–1985, *Personnel Needs and Training for Biomedical and Behavioral Research, 1975…1985 Report*; 1989, *Biomedical and Behavioral Research Scientists: Their Training and Supply*; 1994, *Meeting the Nation's Needs for Biomedical and Behavioral Scientists*.]

National Association of State Universities and Land-Grant Colleges. 1999. The land-grant tradition. http://www.nasulgc.org/publications/Land_Grant/Land_Grant_Main.htm. Accessed April 2005.

National Board on Graduate Education. 1972. *An Annotated Bibliography on Graduate Education, 1971–1972.* Washington, DC.

National Board on Graduate Education. 1976. *Minority Group Participation in Graduate Education: A Report With Recommendations of the National Board on Graduate Education.* Washington, DC: National Academy of Sciences.

National Opinion Research Center (NORC). 1998–2002. *Doctorate Recipients from United States Universities: Summary Report 1997…2001*. Annual series of survey results from the Survey of Earned Doctorates, conducted by NORC for the National Science Foundation, National Institutes of Health, National En-

dowment for the Humanities, U.S. Department of Education, U.S. Department of Agriculture, and National Aeronautics and Space Administration. Chicago.

National Science Board. 1972–2002. *Science and Engineering Indicators 1972…2002.* Biennial series. Arlington, VA: National Science Foundation.

National Science Board. 1998. *The Federal Role in Science and Engineering Graduate and Postdoctoral Education*. NSB 97-235. Arlington, VA: National Science Foundation.

National Science Foundation. 1964. *Comparisons of Earned Degrees Awarded 1901–1962.* NSF 64-2. Washington, DC.

National Science Foundation. 1975–2000. *Women, Minorities, and Persons with Disabilities in Science and Engineering: 1973…2000*. Biennial series. Arlington, VA.

National Science Foundation. 1982 and 1995–2002. *Science and Engineering Degrees, 1950–80, 1966–93…1966–2000*. Annual series. Arlington, VA.

National Science Foundation. 1990. *Selected Data on Historically Black Colleges and Universities, Academic Year 1988*. Washington, DC.

National Science Foundation. 1992, 1996. *Undergraduate Origins of Recent Science and Engineering Doctorate Recipients*. Periodic series. Arlington, VA.

National Science Foundation. 1993a. *Science and Engineering Doctorates: 1960–91*. NSF 93-301. Washington, DC.

National Science Foundation. 1993b. *Foreign Participation in U.S. Academic Science and Engineering: 1991*. NSF 93-302. Washington, DC.

National Science Foundation. 1993–2003. *Characteristics of Doctoral Scientists and Engineers in the United States: 1991…2001*. Biennial series. Arlington, VA.

National Science Foundation. 1994–96. *Selected Data on Science and Engineering Doctorate Awards, 1993…1995*. Annual series. Arlington, VA.

National Science Foundation. 1995. *Nonacademic Scientists and Engineers: Trends From the 1980 and 1990 Censuses*. NSF 95-306. Arlington, VA.

National Science Foundation. 1995–2002. *Science and Engineering Degrees, by Race/Ethnicity of Recipients: 1985–93…1991–2000.* Annual series. Arlington, VA.

National Science Foundation. 1997. *Who Is Unemployed? Factors Affecting Unemployment Among Individuals with Doctoral Degrees in Science and Engineering*. NSF 97-336. Arlington, VA.

National Science Foundation. 1997–2002. *Science and Engineering Doctorate Awards: 1996…2001*. Annual series. Arlington, VA.

National Science Foundation. 1998a. *Statistical Profiles of Foreign Doctoral Recipients in Science and Engineering: Plans to Stay in the United States*. NSF 99-304. Arlington, VA.

National Science Foundation. 1998b. *Doctoral Scientists and Engineers in the United States: 1995 Profile*. NSF 99-305. Arlington, VA.

National Science Foundation. 1999. *Federal Funds Survey: Detailed Historical Tables, Fiscal Years 1951–99.* http://www.nsf.gov/statistics/nsf99347/.

National Science Foundation. 2000a. *Graduate Education Reform in Europe, Asia, and the Americas and International Mobility of Scientists and Engineers: Proceedings of an NSF Workshop*. NSF 00-318. Arlington, VA.

National Science Foundation. 2000b. *Modes of Financial Support in the Graduate Education of Science and Engineering Doctorate Recipients*. NSF 00-319. Arlington, VA.

National Science Foundation. 2000c. *State Science and Engineering Profiles and R&D Patterns: 1997–98*. NSF 00-329. Arlington, VA.

National Science Foundation. 2002a. *Science and Engineering Degrees, 1966–2000*. NSF 02-327. Arlington, VA.

National Science Foundation. 2002b. *Doctoral Scientists and Engineers: 1999 Profiles.* NSF 03-302. Arlington, VA.

Nerad, M. 1999. *The Academic Kitchen: A Social History of Gender Stratification at the University of California, Berkeley.* Albany: State University of New York Press.

Nerad, M., and J. Cerny. 1999a. From rumors to facts: Career outcomes of English Ph.D.s.; results from the *Ph.D.*'s—*Ten Years Later* study. *Council of Graduate Schools Communicator* 32(7):1–11.

Nerad, M., and J. Cerny. 1999b. Postdoctoral patterns, career advancement, and problems. *Science* 285 (September 3): 1533–5.

Nerad, M. 2000. The PhD in the US: Criticisms, facts, and remedies. *International Association of Universities/Higher Education Policy*, 17:183–199.

Nerad, M., R. June, and D.S. Miller, eds. 1997. *Graduate Education in the United States*. New York: Garland Press.

Nerad, M., and C.L. Stewart. 1991. Assessing doctoral student experience: Gender and departmental culture. *Higher Education Abstracts* (winter). Claremont, CA: Claremont Graduate School.

Newcomer, M. 1959. *A Century of Higher Education for American Women.* New York: Harper.

Noboa-Ríos, A. 1981–82. An analysis of Hispanic doctoral recipients from U.S. universities (1900–1973) with special emphasis on Puerto Rican doctorates. *Metas* 2 (winter): 1–133.

Oleson, A., and J. Voss, eds. 1979. *The Organization of Knowledge in Modern America, 1860–1920*. Baltimore: Johns Hopkins University Press.

Oxtoby, T., R. Mugge, and D. Wolfle. 1952. Enrollment and graduation trends: From grade school to Ph.D. *School and Society* 76:209–18.

Parsons, T., and G.M. Platt. 1973. *The American University*. Cambridge, MA: Harvard University Press.

President's Science Advisory Committee. 1958. *Strengthening American Science*. Washington, DC: U.S. Government Printing Office.

President's Science Advisory Committee. 1959. *Education for the Age of Science*. Washington, DC: U.S. Government Printing Office.

President's Science Advisory Committee. 1960. *Scientific Progress, the Universities, and the Federal Government*. Washington, DC: U.S. Government Printing Office.

President's Science Advisory Committee. 1962. *Meeting Manpower Needs in Science and Technology, Report Number One: Graduate Training in Engineering, Mathematics, and Physical Sciences*. Washington, DC: U.S. Government Printing Office.

Quintana-Baker, M. 2002a. A profile of Mexican American, Puerto Rican, and other Hispanic STEM doctorates: 1983–1997. *Journal of Women and Minorities* 8:99–121.

Quintana-Baker, M. 2002b. *Making the Pieces Fit: Exceptional Practices at the Baccalaureate Level at Selected Hispanic Serving Institutions*. Washington, DC: American University.

Rock, D.A. 1974. *The Prediction of Doctorate Attainment in Psychology, Mathematics, and Chemistry*. Graduate Record Examinations Board Report No. 69-6AR. Princeton, NJ: Educational Testing Service.

Roose, K.D., and C.J. Andersen. 1970. *A Rating of Graduate Programs*. Washington, DC: American Council on Education.

Rosenberg, R.P. 1961. The first American doctor of philosophy degree. *Journal of Higher Education* 32(7):387–94.

Rudolph, F. 1962. *The American College and University: A History*. New York: Alfred A. Knopf.

Ryan, W.C. 1939. *Studies in Early Graduate Education: The Johns Hopkins University, Clark University, The University of Chicago*. New York: Carnegie Foundation for the Advancement of Teaching.

Sherby, L.S., ed. 2002. *The Who's Who of Nobel Prize Winners 1901–2000*. 4th ed. Westport, CT: Oryx Press.

Slosson, E.E. 1910. *Great American Universities*. New York: Macmillan.

Smith, B.L.R., ed. 1985. *The State of Graduate Education*. Washington, DC: Brookings Institution.

Solmon, L.C. 1973. Women in doctoral education: Clues and puzzles regarding institutional discrimination. *Research in Higher Education* 1(4):299–332.

Solmon, L.C., and P. Taubman, eds. 1973. *Does College Matter? Some Evidence on the Impacts of Higher Education*. New York: Academic Press.

Solomon, B.M. 1985. *In the Company of Educated Women: A History of Women and Higher Education in America*. New Haven, CT: Yale University Press.

Solorzano, D.G. 1995.The baccalaureate origins of Chicana and Chicano doctorates in the social sciences. *Hispanic Journal of Behavioral Sciences* 17:3–32.

Speicher, A.L. 2000. The Association of American Universities: A century of service to higher education. http://www.aau.edu/aau/Begin.html. Accessed April 2005.

Starr, P. 1982. *The Social Transformation of American Medicine*. New York: Basic Books.

Storr, R.J. 1953. *The Beginnings of Graduate Education in America*. Chicago: University of Chicago Press.

Storr, R.J. 1973. *The Beginning of the Future*. New York: McGraw-Hill.

Tidball, M.E. 1986. Baccalaureate origins of recent natural science doctorates. *Journal of Higher Education* 57:606–20.

Tidball, M.E., and V. Kistiakowsky. 1976. Baccalaureate origins of American scientists and scholars. *Science* 193 (August 20): 646–52.

Tidball, M.E., D.G. Smith, C.S. Tidball, and L.E. Wolf-Wendel. 1999. *Taking Women Seriously: Lessons and Legacies for Educating the Majority*. Phoenix: American Council on Education and Oryx Press.

Titcomb, C. 1997. The earliest Ph.D. awards to blacks in the natural sciences. *Journal of Blacks in Higher Education* 15 (spring): 92–101.

U.S. Census Bureau. 1975. *Historical Statistics of the United States, Colonial Times to 1970*. Bicentennial ed. Washington, DC.

U.S. Census Bureau. 1998–2001. *Statistical Abstract of the United States*. 118th–121st eds. Annual series. Washington, DC.

U.S. Department of Agriculture. 2003. 1890 land grant universities. http://www.reeusda.gov/1890. Accessed March 2003.

U.S. Department of Education, National Center for Education Statistics. 1962–2002. *Digest of Education Statistics, 1962…2001*. Annual series. Washington, DC.

U.S. Department of Education, National Center for Education Statistics. 1985. The traditionally black institutions of higher education, 1860 to 1982. Washington, DC. http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=84308. Accessed April 2005.

U.S. Department of Education, National Center for Education Statistics. 1993. *120 Years of American Education: A Statistical Portrait*. Washington, DC.

U.S. Department of Education, National Center for Education Statistics. 1996. *Historically Black Colleges and Universities, 1976–1994*. Washington, DC.

U.S. National Institutes of Health, National Research Council. 1969. *Effects of NIGMS Training Programs on Graduate Education in the Biomedical Sciences: An Evaluative Study of the Training Programs of the National Institute of General Medical Sciences, 1958–1967*. Bethesda, MD: U.S. National Institute of General Medical Sciences.

U.S. National Institutes of Health, National Research Council. 1971. *Education and Employment Patterns of Bioscientists: A Statistical Report*. Bethesda, MD: National Institute of General Medical Sciences.

U.S. Office of Education. 1869–1916. *Annual Report of the United States Commissioner of Education.* Washington, DC: U.S. Government Printing Office.

U.S. Office of Education. 1917–56. *Biennial Survey of Education in the United States.* Washington, DC: U.S. Government Printing Office.

Veysey, L.R. 1965. *The Emergence of the American University*. Chicago: University of Chicago Press.

Walcott, G.D. 1915. Statistical study of doctor of philosophy men. *School and Society* 1 (January): 66–71, 102–7.

Walters, E. 1965. The rise of graduate education. In E. Walters, ed., *Graduate Education Today*, pp. 1–29. Washington DC: American Council on Education.

White House Initiative on Historically Black Colleges and Universities. 2002. http://www.ed.gov/about/inits/list/whhbcu/edlite-index.html. Accessed April 2005.

Wilson, J.G., and J. Fiske. 1889. *Appleton's Cyclopaedia of American Biography.* New York: D. Appleton and Company.

Wilson, J.T. 1983. *Academic Science, Higher Education, and the Federal Government, 1950–1983*. Chicago: University of Chicago Press.

Wolf-Wendel, L.E. 1998. Models of excellence: The baccalaureate origins of successful European American women, African American women, and Latinas. *The Journal of Higher Education* 69 (March/April): 141–86.

Wolfle, D. 1972. *The Home of Science: The Role of the University*. New York: McGraw-Hill.